United States
Department of
Agriculture

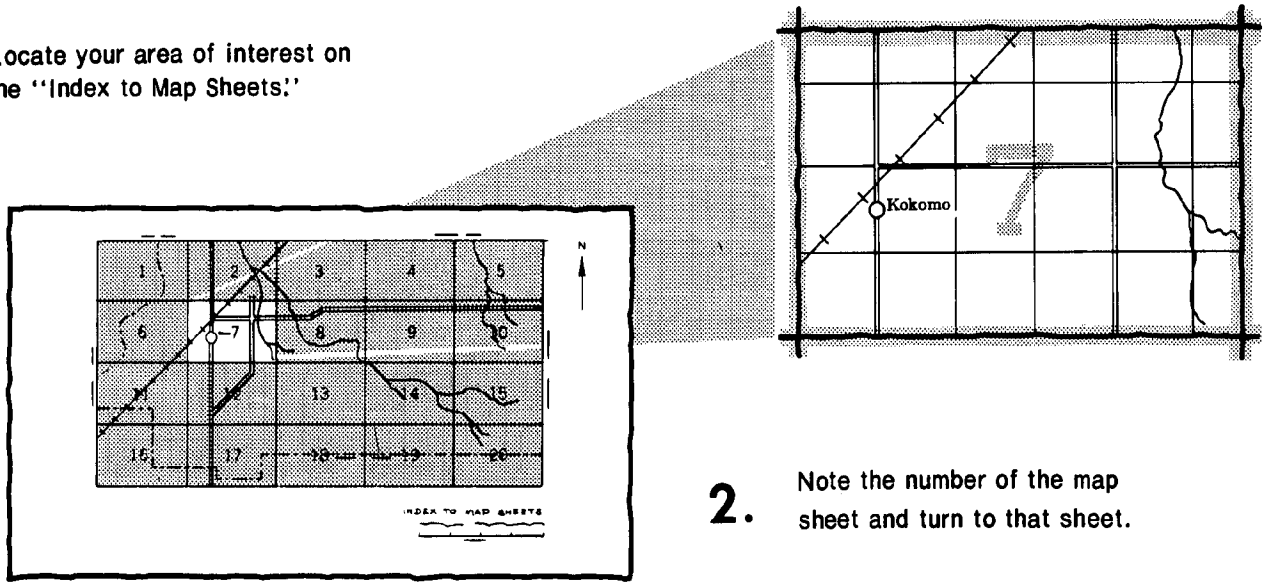
Soil
Conservation
Service

In cooperation with
New Jersey Agricultural
Experiment Station,
Cook College,
Rutgers,
the State University,
and the
New Jersey Department of
Agriculture

Soil Survey of Middlesex County New Jersey

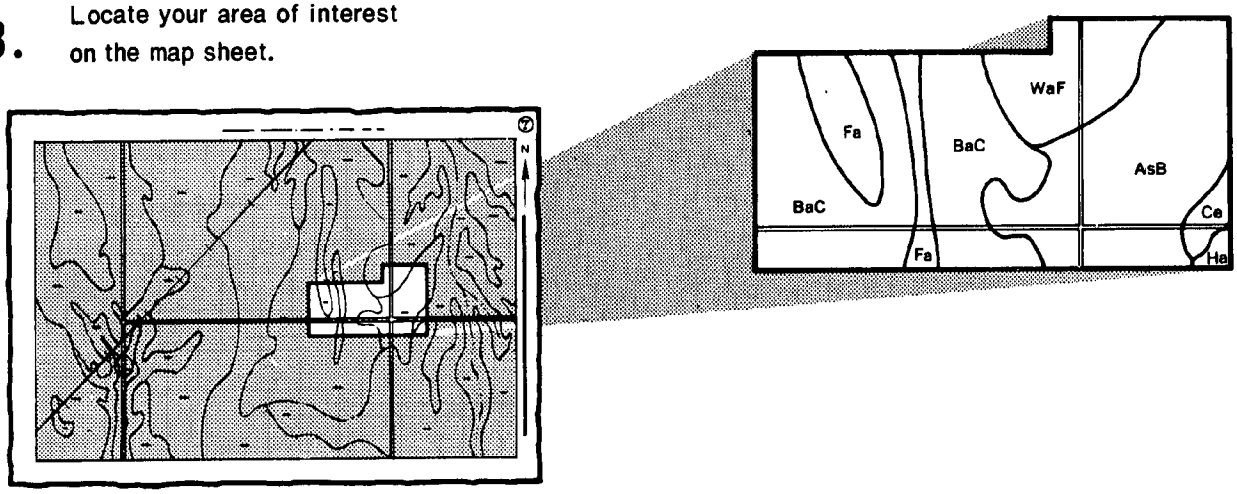
HOW TO USE

1. Locate your area of interest on the "Index to Map Sheets."

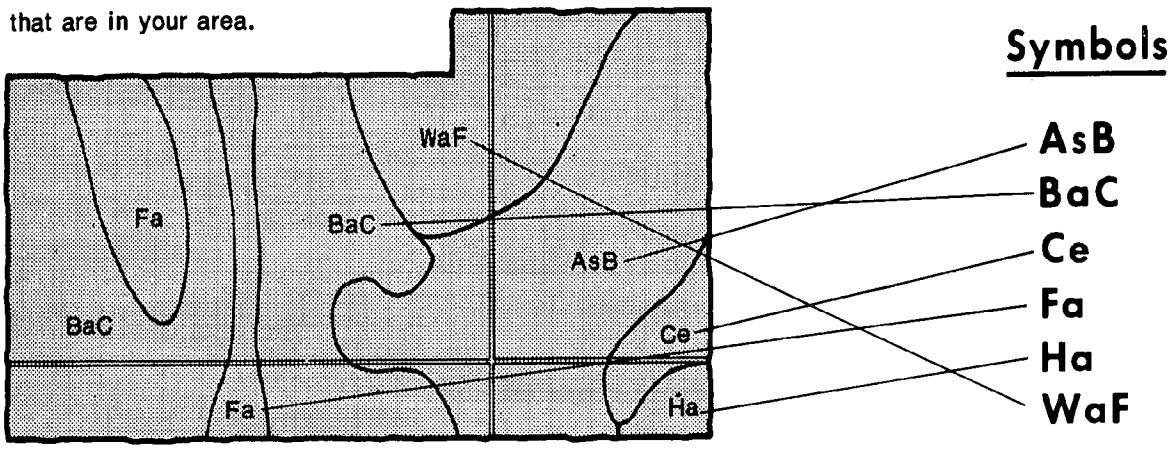


2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.

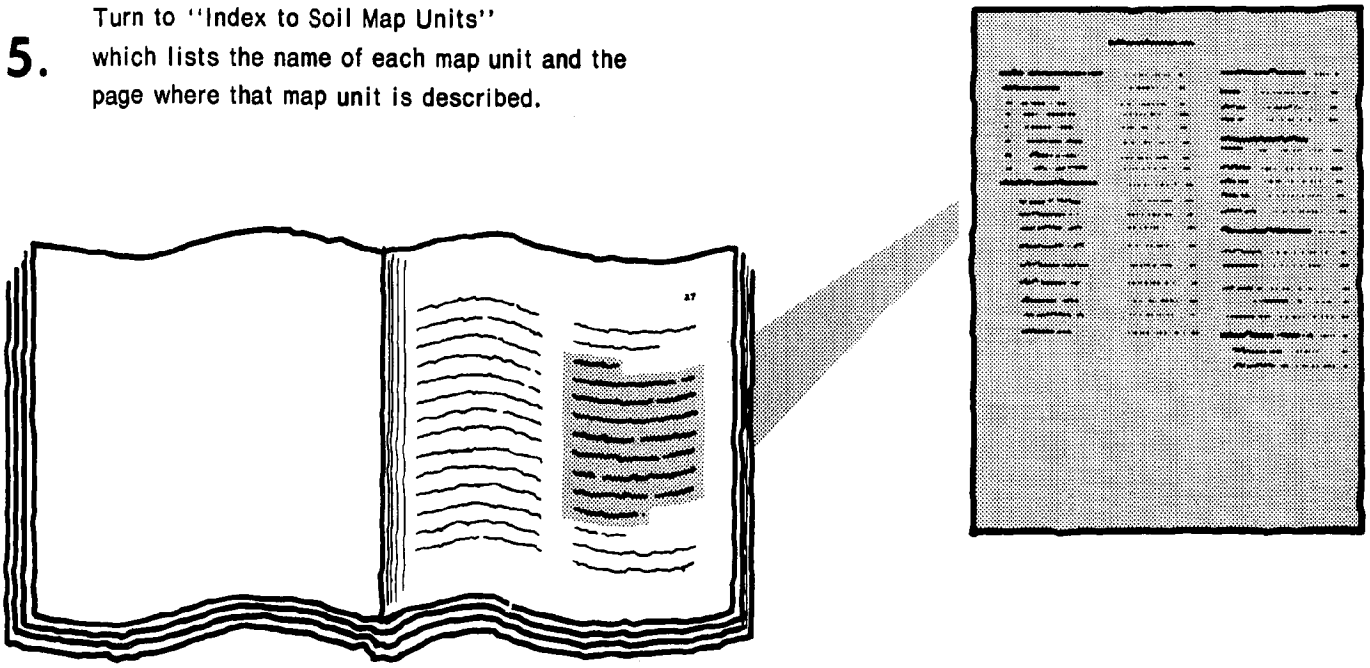


4. List the map unit symbols that are in your area.

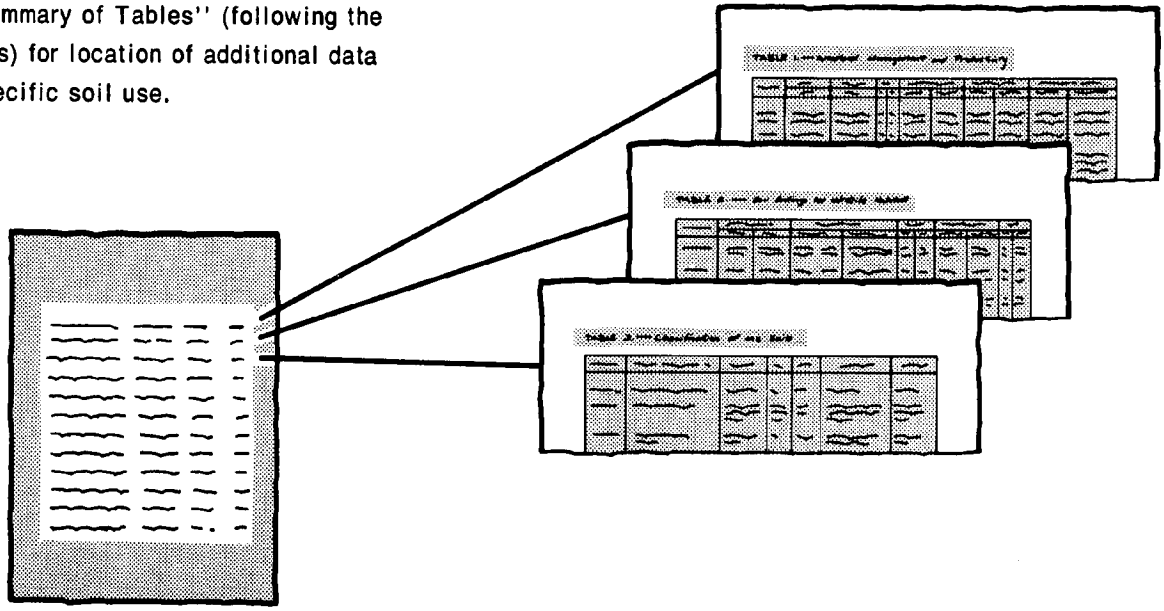


THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in 1978. Soil names and descriptions were approved in 1979. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1977. This survey was made by the Soil Conservation Service in cooperation with the New Jersey Agricultural Experiment Station, Cook College, Rutgers, the State University, and the New Jersey Department of Agriculture. Others who contributed to the survey were the Middlesex County Board of Chosen Freeholders and the Freehold Soil and Water Conservation District. The survey is part of the technical assistance furnished to the Freehold Soil and Water Conservation District.

Cover: A field of Japanese yews in Middlesex County.

Contents

Soil Series

Issued April 1987

Index to Map Units

Summary of Tables

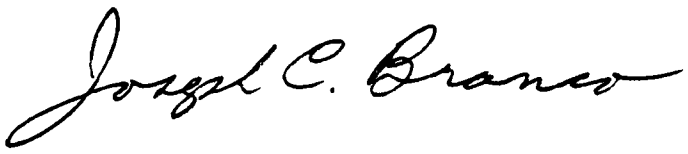
Foreword

This soil survey contains information that can be used in land-planning programs in Middlesex County. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.



Joseph C. Branco
State Conservationist
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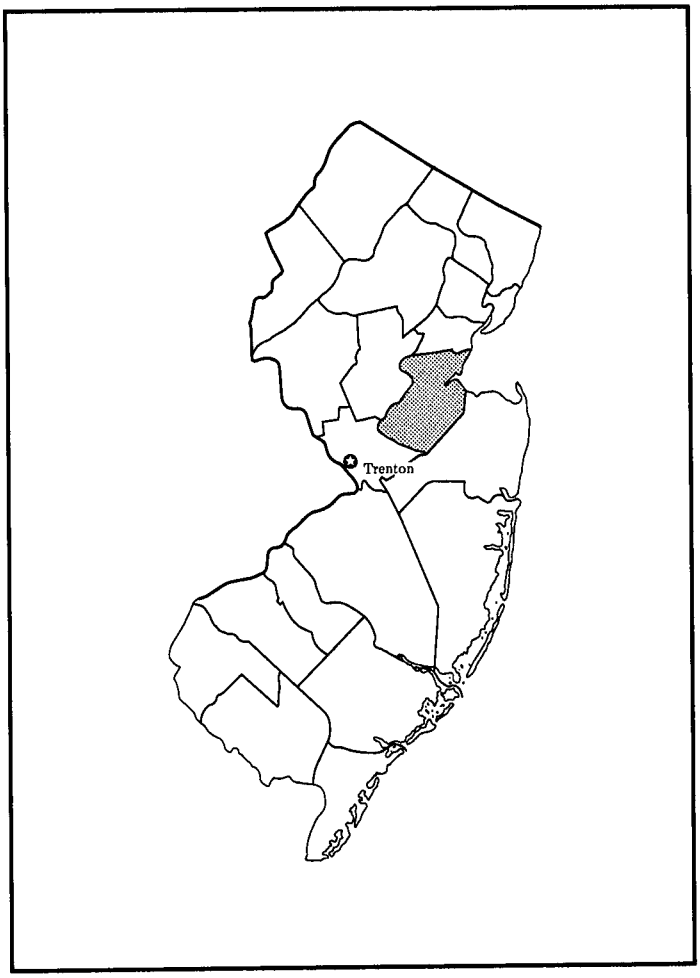

Location of Middlesex County in New Jersey.

Soil Survey of
Middlesex County, New Jersey

By Van R. Powley, Soil Conservation Service

Soils surveyed by Van R. Powley and
David L. Smith, Soil Conservation Service, and
Dana G. Young, New Jersey Department of Agriculture

United States Department of Agriculture, Soil Conservation Service
In cooperation with
New Jersey Agricultural Experiment Station,
Cook College,
Rutgers, the State University, and
New Jersey Department of Agriculture

MIDDLESEX COUNTY is in the east-central part of New Jersey, adjacent to Raritan Bay. New Brunswick, the largest city and the county seat, is at the head of navigation of the Raritan River. It has a population of 595,893, according to the 1980 census.

The county is 318 square miles, or 203,520 acres, 3,840 acres of which is water. In 1982, 106,043 acres in the county was farmland or woodland.

The major waterways in the county are the Raritan, Rahway, South, Millstone, Manalapan, and Matchaponix Rivers. They flow into Raritan Bay.

General Nature of the County

Settlement

The first known visitors to what is now Middlesex County were Giovanni de Verrazano and Henry Hudson in 1609.

The earliest recorded settlement in this county was by immigrants of English descent. They came from the Piscataqua River valley in New Hampshire and from Newbury, Massachusetts. They brought the name Piscataqua with them when they settled in Piscataway in 1666.

New Jersey once was divided into the provinces of East Jersey and West Jersey. In 1682 the New Jersey Assembly subdivided the East Jersey Province into the counties of Middlesex, Monmouth, Essex, and Bergen.

Water Courses and Drainage

The Raritan River flows west to east across the central part of the county and discharges into Raritan Bay. The part of the Raritan River within the county is about 19 miles, nearly 70 percent of which is navigable and tidal.

In the northwestern part of the county, Green Brook forms the boundary between Somerset and Middlesex Counties. Tributaries to Green Brook are Ambrose, Bound, and Bonygutt Brooks. Within Middlesex County, Green Brook has a drainage area of 42 square miles and forms the western boundary of Dunellen and the borough of Middlesex, where it discharges into the Raritan River.

In the north-central part of the county is the Rahway River. It flows in an easterly direction and forms the boundary between Union and Middlesex Counties, where it empties into the Arthur Kill. Approximately 22 square miles of the drainage area of the Rahway River lies within Middlesex County.

The southeastern part of Middlesex County is drained by the South River and its tributaries. The South River is the second largest waterway in the county. It flows in a northerly direction and extends about 8 miles south of the Raritan River. The western tributary, Manalapan Brook, is one of the two largest tributaries to the South River. About 24 square miles of the 44-square-mile drainage area of the Manalapan Brook is in Middlesex County. Matchaponix Brook is the eastern tributary to the South River. It has a watershed about 44 square miles, 15 square miles of which is Middlesex County.

In the southwestern part of the county Millstone River forms the boundary between Somerset and Middlesex Counties. The drainage area in Middlesex County is primarily agricultural land with nearly level to gently sloping Coastal Plain deposits. The drainage area of the Millstone River at Carnegie Lake is 99 square miles, 53 square miles of which is in Middlesex County.

Farming

About 16 percent of the county is in farms, most of which are vegetable farms. Grain farming is common in the southern part of the county. Middlesex county ranks third in the state for potato production and fifth for nursery plants. The sources of income are mainly field crops, vegetables, and dairy products, but also include horticultural products. As late as 1964, Middlesex County ranked 56th in the nation in acreage used for potatoes. In 1969, the county ranked 38th in the United States in the sale of nursery and greenhouse products.

Transportation and Industry

Middlesex County is served by a network of major highways and four rail lines. The main routes are the New Jersey Turnpike, the Garden State Parkway, U.S. Highways 1 and 9, and Interstate 287. The Arthur Kill, on Middlesex County's eastern boundary, is one of the principal deepwater shipping arteries of the world.

One of the most noteworthy early industries in the county was the making of brick from the deep clay beds along the Raritan River. In 1825 Michael Lefoulon and Henry DeCasse started the Salamander Works, soon to be the state's biggest clay manufacturer. By 1878, eight Raritan River brickyards turned out 54 million bricks annually.

Along with farming and transportation, the main industries in the county specialize in secondary processing of basic organic chemicals, petroleum, and primary metals. The newer areas of economic involvement are in such fields as pharmaceuticals, plastics, adhesives, coatings, and solvents. More than 100 of the Nation's 500 largest industries have facilities in Middlesex County.

Education

In 1771 the Dutch Reformed Church established Queens College, which later became a part of Rutgers, the State University. The Morrill Act of 1864 established Rutgers as the Land Grant College of Agriculture and Mechanics.

Besides Rutgers, the Forestal Campus of Princeton University, Middlesex County College, four county technical high schools, and numerous private, vocational, technical, and trade schools are in the county.

Geology and Relief

Thomas A. Iivari, geologist, Soil Conservation Service, assisted with the preparation of this section.

Middlesex County is in two major physiographic provinces, the Coastal Plain and the Piedmont. The differences in the two provinces are based largely upon the rocks, the bedrock structure, the climate, and the geomorphic history.

An area covering about the northwestern third of the county is in the Piedmont physiographic province and is underlain, for the most part, by soft red shale of the Newark group of Triassic age. The Newark group in Plainsboro and South Brunswick Townships contains small amounts of dark, hard argillite and gray sandstone. The Piedmont part of the county is typically a nearly flat plain dotted with rounded hills. The elevation is about 60 to 100 feet above sea level in the Woodbridge-Piscataway area and 200 to 240 feet above sea level in South Brunswick Township.

Intruded into the rocks of the Newark group is a thick diabase dike which extends from Carteret to Rocky Hill but is at the surface only from Deans to Rocky Hill. The resistant argillite and diabase in part account for the higher elevation in the Piedmont. The soils formed on the Triassic deposits contain a high percentage of weathered shale and consist mostly of silt or fine sand. The diabase is a fine-grained traprock that is nearly devoid of quartz and is the parent material for silt loam.

The remaining two-thirds of the county is in the Coastal Plain physiographic province and is underlain by unconsolidated sands and clays of Cretaceous age. The Coastal Plain mainly is a nearly level surface with slight undulations. The elevation is mainly between 100 and 140 feet above sea level. Eight geologic formations comprise the Coastal Plain in Middlesex County and consist mostly of alternating layers of dark glauconite, clay, fine sands, and coarse glauconitic sands. Where exposed, soils formed on these formations reflect the character of the underlying parent material.

Most of the Coastal Plain and portions of the Piedmont are overlain by various Quaternary age deposits. The Pennsauken Formation, a sand and gravel deposit, is on most of the higher terraces and divides, and covers most of the plain in the south-central portion

of the county. The Cape May Formation consists of stratified sand and gravel with some clay, and forms low terraces and plains along the South River drainage system. This formation merges into stratified drift in the Raritan Valley. Eolian deposits, consisting of wind-blown sands, cover much of central Old Bridge Township.

The northeastern portion of the county was subject to a period of glaciation which resulted in the formation of a layer of till, or recessional morain, which blankets all of Carteret and portions of Woodbridge and Perth Amboy. A terminal moraine, which is a ridge composed of accumulations of cobbles and boulders of clay, silt, sand, and gravel that mark the southernmost advance of the last glaciers, is along a line from Perth Amboy to South Plainfield. Glacial outwash, in the form of stratified sand and gravel, is immediately to the west of the terminal moraine.

Climate

Prepared by the National Climatic Center, Asheville, North Carolina.

Middlesex County is hot in summer and rather cold in winter. Precipitation is well distributed throughout the year and is normally adequate for general crops. Winter precipitation frequently occurs as snow, but the ground does not usually stay covered for more than a few days at a time.

Table 1 gives data on temperature and precipitation for the survey area as recorded at New Brunswick, New Jersey, in the period 1951 to 1975. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 33 degrees F, and the average daily minimum temperature is 25 degrees. The lowest temperature on record, which occurred at New Brunswick on January 22, 1961, is -6 degrees. In summer the average temperature is 73 degrees, and the average daily maximum temperature is 83 degrees. The highest recorded temperature, which occurred on July 7, 1957, is 102 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

Of the total annual precipitation, 24 inches, or 54 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 21 inches. The heaviest 1-day rainfall during the period of record was 7.66 inches at New Brunswick on August 28, 1971. Thunderstorms occur on about 25 days each year, and most occur in summer.

The average seasonal snowfall is 17 inches. The greatest snow depth at any one time during the period of record was 19 inches. On the average, 13 days of the year have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 54 percent. Humidity is higher at night, and the average at dawn is about 73 percent. The sun shines 65 percent of the time possible in summer and 50 percent in winter. The prevailing wind is from the southwest. Average windspeed is highest, 12 miles per hour, in March.

How This Survey Was Made

This survey was made to provide information about the soils in the survey area. The information includes a description of the soils and their location and a discussion of the suitability, limitations, and management of the soils for specified uses. Soil scientists observed the steepness, length, and shape of slopes; the general pattern of drainage; the kinds of crops and native plants growing on the soils and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material has few or no roots or other living organisms and has been changed very little by other biologic activity.

The soils in the survey area occur in an orderly pattern that is related to the geology, the landforms, relief, climate, and the natural vegetation of the area. Each kind of soil is associated with a particular kind of landscape or with a segment of the landscape. By observing the soils in the survey area and relating their position to specific segments of the landscape, a soil scientist develops a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientist to predict with considerable accuracy the kind of soil at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, acidity, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to

taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. The system of taxonomic classification used in the United States is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpreted the data from these analyses and tests as well as the field-observed characteristics and the soil properties in terms of expected behavior of the soils under different uses. Interpretations for all of the soils were field tested through observation of the soils in different uses under different levels of management. Some interpretations are modified to fit local conditions, and new interpretations sometimes are developed to meet local needs. Data were assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management were assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can state with a fairly high degree of probability that a given soil will have a high water table within certain depths in most years, but they cannot assure that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Map Unit Composition

A map unit delineation on a soil map represents an area dominated by one major kind of soil or an area dominated by several kinds of soil. A map unit is identified and named according to the taxonomic classification of the dominant soil or soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural objects. In common with other natural objects, they have a characteristic variability in their properties. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of soils of other taxonomic classes. Consequently, every map unit is made up of the soil or soils for which it is named and some soils that belong to other taxonomic classes. These latter soils are called inclusions or included soils.

Most inclusions have properties and behavioral patterns similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting (similar) inclusions. They may or may not be mentioned in the map unit descriptions. Other inclusions, however, have properties and behavior divergent enough to affect use or require different management. These are contrasting (dissimilar) inclusions. They generally occupy small areas and cannot be shown separately on the soil maps because of the scale used in mapping. The inclusions of contrasting soils are mentioned in the map unit descriptions. A few inclusions may not have been observed and consequently are not mentioned in the descriptions, especially where the soil pattern was so complex that it was impractical to make enough observations to identify all of the kinds of soil on the landscape.

The presence of inclusions in a map unit in no way diminishes the usefulness or accuracy of the soil data. The objective of soil mapping is not to delineate pure taxonomic classes of soils but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but onsite investigation is needed to plan for intensive uses in small areas.

General Soil Map Units

The general soil map at the back of this publication shows the soil associations in this survey area. Each association has a distinctive pattern of soils, relief, and drainage. Each is a unique natural landscape. Typically, an association consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one association can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one association differ from place to place in slope, depth, drainage, and other characteristics that affect management.

Soil Descriptions

Soils That Formed in Glacial Till or Glacial Outwash

1. Urban land-Boonton-Haledon

Urban land and nearly level to strongly sloping, deep, well drained to somewhat poorly drained soils that have a firm or very firm, loamy subsoil; on uplands

This unit consists of areas of Urban land and soils in the glaciated part of the county.

This unit makes up about 12 percent of the county. The unit is about 40 percent Urban land, 30 percent Boonton soils, 13 percent Haledon soils, and 17 percent soils of minor extent.

Urban land consists of areas used for industrial, commercial, and residential development. Most of the soil around the building foundations and most of the fill material used to support buildings consist of Boonton and Haledon soils that have been cut or graded.

The Boonton soils are well drained and moderately well drained and are gently sloping to strongly sloping. They are on the higher parts of the landscape and on ridges. The Haledon soils are somewhat poorly drained and are nearly level or gently sloping. They are in draws and on toe slopes.

The minor soils in this unit are poorly drained Haledon Variant soils, frequently flooded Parsippany soils, well drained Klinesville soils, and moderately well drained Rowland soils.

All the major soils in this unit have a pan or a panlike layer that slows or prevents the downward percolation of water. This is a limitation for most plants and for construction. The installation of municipal drains has partially corrected this condition.

If drained, the soils of this unit are suitable as sites for homes and industry. The major soils have poor potential for development of wetland wildlife habitat, but the Haledon Variant soils are suitable for that use.

2. Urban land-Dunellen Variant-Ellington Variant-Dunellen

Urban land and nearly level to gently sloping, deep, well drained and moderately well drained soils that have a loamy subsoil; on uplands

This unit consists of areas of Urban land and soils in the northwestern corner of the county. These soils formed in stratified sand and gravel that is sediments from glacial meltwater.

This unit makes up about 6 percent of the county. The unit is about 50 percent Urban land, 17 percent Dunellen Variant soils, 12 percent Ellington Variant soils, 8 percent Dunellen soils, and 13 percent soils of minor extent.

Urban land consists of areas used for industrial, commercial, and residential development. Most of the soils around the building foundations and most of the fill material used to support buildings consist of Dunellen and Ellington soils that have been cut or graded. The Dunellen Variant soils are moderately well drained and are on slight rises on the landscape. The Ellington Variant soils are moderately well drained and overlie red shale bedrock at a depth of about 36 inches. The Dunellen soils are well drained and overlie stratified sandy outwash material at the high positions on the landscape.

The minor soils in this unit are moderately well drained Rowland soils, poorly drained Parsippany Variant soils, frequently flooded Parsippany soils, and Lansdowne Variant soils. Flooding is common on most of the minor soils.

Most of this unit is used for urban development. Wetness is a limitation that has been corrected by

subsurface drainage. The potential for development of wetland wildlife habitat is poor because of the lack of open space.

Soils That Formed in Material That Weathered from Shale or Diabase

3. Klinesville-Urban land-Reaville-Lansdowne

Nearly level to steep, shallow to deep, well drained and moderately well drained soils that have a loamy subsoil containing shale fragments; areas of Urban land; on uplands

This unit is in areas along the western side of the county. Parts of the unit in Piscataway Township are at an elevation of more than 120 feet above sea level.

This unit makes up about 7 percent of the county. The unit is about 45 percent Klinesville soils, 25 percent Urban land, 15 percent Reaville soils, 10 percent Lansdowne soils, and 5 percent soils of minor extent.

The Klinesville soils are well drained and gently sloping to steep. They are on the highest positions on the landscape. They overlie red shale bedrock at a depth of less than 20 inches.

Urban land consists of areas used for industrial, commercial, and residential development. Most of the soil around building foundations and most of the fill material used to support buildings consist of Klinesville and Reaville soils that have been cut or graded.

The Reaville soils are moderately well drained and nearly level to gently sloping. They overlie red shale bedrock at a depth of 20 to 40 inches. They are in draws and on toe slopes.

The Lansdowne soils are moderately well drained and nearly level to gently sloping. They overlie red shale bedrock at a depth of 42 to 60 inches. They are on broad flats and in drainageways.

The minor soils in this unit are poorly drained Reaville Variant soils and well drained Penn soils.

A few fields in this unit are used for cultivated crops, but nearly all of the unit is wooded or used for urban development. The soils that are shallow to bedrock are droughty in summer. The seasonal high water table in the Reaville and Lansdowne soils limits their suitability for crops. Ponding and flooding are hazards on the Lansdowne and Reaville soils. The potential for development of wetland wildlife habitat is good on the Reaville and Lansdowne soils but poor on the Klinesville soils.

4. Mount Lucas-Watchung-Chalfont

Nearly level to gently sloping, deep, moderately well drained to poorly drained soils that have a loamy subsoil containing fragments of diabase or shale; on uplands

This unit consists of areas of soils in and around Little Rocky Hill in South Brunswick Township. These soils formed in an igneous rock intrusion of diabase and metaphorphose shale. Because this rock formation and the adjoining burned shale are resistant to erosion and weathering, this unit is at a high position on the landscape.

This unit makes up about 2 percent of the county. The unit is about 50 percent Mount Lucas soils, 15 percent Watchung soils, 15 percent Chalfont soils, and 20 percent soils of minor extent.

The Mount Lucas soils are moderately well drained and nearly level to gently sloping. They are at the highest positions on the landscape. Some of the Mount Lucas soils have a very stony surface layer. The Watchung soils are poorly drained and nearly level. They are on broad flats and in depressions. The Watchung soils overlie diabase bedrock at a depth of 60 inches or more. The Chalfont soils are somewhat poorly drained and nearly level to gently sloping. They are on side slopes and toe slopes. The Chalfont soils overlie burned shale bedrock.

The minor soils in this unit are very poorly drained Fallsington soils, poorly drained Reaville Variant soils, and somewhat poorly drained Humaquepts.

Most of this unit is in woodland or native vegetation. Stones on the surface and wetness are the main limitations for farming or urban development. Ponding is a hazard on the Watchung soils. This unit has good potential for recreation and wildlife habitat.

5. Sassafras-Woodstown

Nearly level to strongly sloping, deep, well drained and moderately well drained soils with a loamy subsoil and sandy substratum; on uplands

This association consists of soils in the Coastal Plain part of the county between the Raritan River and Plainsboro.

This unit makes up about 15 percent of the county. The unit is about 60 percent Sassafras soils, 20 percent Woodstown soils, and 20 percent soils of minor extent.

The Sassafras soils are well drained and nearly level to strongly sloping. They are at the highest positions on the landscape. The Woodstown soils are moderately well drained and nearly level to gently sloping. They are on the lower slopes and on broad flats.

The minor soils are poorly drained Fallsington soils, well drained Downer soils, well drained Matapeake soils, moderately well drained Mattapex and Hammonton soils, and Urban land.

The soils in this unit are used mainly for agriculture (fig. 1). Soybeans, potatoes, wheat, corn, fruit, nursery crops, and other vegetables are the main crops. Wetness is the main limitation in the Woodstown and Fallsington soils, and ponding is common during excessively wet periods or following heavy rains.

This association has good potential for cultivated crops. The Sassafras and Woodstown soils are classified as prime farmland. The use of drainage generally

Figure 1.—A large field of cabbage in the Sassafras-Woodstown general soil map unit.

overcomes wetness. The potential for development of wetland wildlife habitat is poor.

6. Woodstown-Fallsington-Sassafras

Nearly level to strongly sloping, deep, moderately well drained, poorly drained, and well drained soils with a loamy subsoil and sandy substratum; on uplands

This unit consists of soils in the Coastal Plain part of the county between East Brunswick and Mercer County.

This unit makes up about 13 percent of the county. The unit is about 30 percent Woodstown soils, 25 percent Fallsington soils, 15 percent Sassafras soils, and 30 percent soils of minor extent.

The Woodstown soils are moderately well drained and nearly level to gently sloping. They are at intermediate positions on the landscape. The Fallsington soils are poorly drained and nearly level (fig. 2). They are in depressions, on broad flats, and in lower positions. The Sassafras soils are well drained and nearly level to strongly sloping. They are at the highest positions on the landscape.

The minor soils in this unit are very porly drained Mullica soils, well drained Nixon soils, moderately well drained Mount Lucas and Nixon Variant soils, Urban land, and poorly drained Fallsington Variant soils.

The soils in this unit are used mostly for grain, fruits, and woodland. The Woodstown soils are mostly cleared. The Sassafras soils are nearly all cleared. The Fallsington soils are mostly wooded. Wetness is the main limitation of these soils for most purposes.

If drained, these soils have good potential for cultivated crops. Wetness is a limitation for urban development. Drainage outlets for the removal of excess water are difficult to establish in most areas. The potential for development of wetland wildlife habitat is good.

7. Matapeake-Mattapex

Nearly level to gently sloping, deep, well drained and moderately well drained soils with a loamy subsoil and substratum; on uplands

Figure 2.—Slow runoff and ponding on Fallsington loam.

This unit is in two areas in the Coastal Plain part of the county. One area is between Dayton and Jamesburg, and the other is southeast of Kingston.

This unit makes up about 3 percent of the county. The unit is about 50 percent Matapeake soils, 25 percent Mattapex soils, and 25 percent soils of minor extent.

The Matapeake soils are well drained and at slightly higher positions on the landscape. The Mattapex soils are moderately well drained and are at the lower elevations.

The minor soils in this unit are Sassafras loam, Nixon loam, Woodstown loam, Nixon Variant loam, and Urban land.

This association is used mainly for grain, vegetables, and fruits. Most of the acreage has been cleared, and some has been drained. Wetness in the Mattapex soils and some minor soils is the main limitation for farming and most other purposes. Local ponding occurs on some areas of the Mattapex soils in winter or spring or following heavy rains in summer.

If drained, these soils have good potential for cultivated crops. The Mattapex soils have poor potential for residential development or other urban uses. The potential for development of wetland wildlife habitat is good on the Mattapex soils.

8. Downer-Urban Land-Hammonton

Nearly level to moderately sloping, deep, well drained and moderately well drained soils with a loamy subsoil and sandy substratum; Urban land; on uplands

This unit is in areas in Sayerville, South River, Spotswood, and Sand Hills. These areas are on medium-age and old sandy and gravelly deposits of the Coastal Plain.

This unit makes up about 7 percent of the county. The unit is about 35 percent Downer soils, 25 percent Urban land, 15 percent Hammonton soils, and 25 percent soils of minor extent.

The Downer soils are well drained and nearly level to moderately sloping. They are on side slopes overlooking the Raritan River in Sayerville, in South River, and near Manalapan Brook in Spotswood. Urban land consists of areas that are used by industrial, commercial, and residential development. Most of the soil around building foundations and most of the fill material used to support buildings consist of Downer and Hammonton soils that have been cut or graded. The Hammonton soils are moderately well drained and nearly level. They are at lower elevations.

The minor soils in this unit are well drained Fort Mott and Phalanx soils.

This unit mainly is wooded, in native vegetation, and in urban uses. Only a small part is used for farming. Low available water capacity is the main limitation of this unit. The Hammonton soils sometimes have a seasonal high water table that limits some uses. The potential for development of wetland wildlife habitat is poor.

9. Keyport-Elkton

Nearly level to strongly sloping, deep, moderately well drained and poorly drained soils with a loamy subsoil and substratum; on uplands

This unit is on exposed, deeper Coastal Plain beds and lacustrine deposits.

This unit makes up about 8 percent of the county. The unit is about 50 percent Keyport soils, 25 percent Elkton soils, and 25 percent soils of minor extent.

Most of the Keyport soils are moderately well drained and nearly level to strongly sloping. They are at the higher positions on the landscape. The Elkton soils are poorly drained and nearly level. They are on broad flats and in depressions.

The minor soils are frequently flooded Humaquepts, Klej, clayey substratum, and Woodstown soils and Hammonton soils with a clayey substratum.

Most of this unit is in native vegetation or woodland, but some of the Keyport soils are used for soybeans and apple orchards. There are some swampy undrained areas. Wetness is the main limitation of these soils for farming and most other purposes. Ponding is common on the Elkton soils and some of minor soils in winter, spring, and following heavy rains.

If drained and protected from erosion, the Keyport soils have good potential for apples, grain, and pasture. If drained, the Elkton soils have limited potential for hay and pasture. Wetness and slow water removal are limitations for residential development and other urban uses. The potential for development of wetland habitat is very good.

10. Urban Land-Nixon-Nixon Variant

Urban land and nearly level to gently sloping, deep, well drained and moderately well drained soils with a loamy subsoil and substratum; on uplands

This unit is on the eastern edge of the Piedmont between Metuchen and Milltown.

This unit makes up about 7 percent of the county. The unit is about 35 percent Urban land, 20 percent Nixon soils, 20 percent Nixon Variant soils, and 25 percent soils of minor extent.

Urban land consists of areas used for industrial, commercial, and residential development. Most of the soil around building foundations and most of the fill material used to support buildings consist of Nixon and Nixon Variant soils that have been cut or graded.

The Nixon soils are well drained and are at slightly higher positions on the landscape. The Nixon Variant soils are moderately well drained and are at the lower positions.

The minor soils are well drained Sassafras soils, moderately well drained Woodstown soils, moderately well drained Lansdowne soils, and poorly drained Fallsington Variant soils.

Most of this unit is in urban uses. Wetness of the Nixon Variant soils is the main limitation for farming and most other purposes. Some drained areas are used for cultivated crops and urban uses. The potential for development of wetland wildlife habitat is poor, especially near the large urban areas.

11. Shrewsbury-Holmdel-Pemberton

Nearly level, deep, poorly drained to moderately well drained soils with a loamy subsoil and a sandy or loamy substratum; on uplands

The soils in this unit are on older, deeper Coastal Plain beds.

This unit makes up about 2 percent of the county. The unit is about 30 percent Shrewsbury soils, 20 percent Holmdel soils, 10 percent Pemberton soils, and 40 percent soils of minor extent.

The Shrewsbury soils are poorly drained and are at the lower elevations on the landscape. The Holmdel soils are moderately well drained and somewhat poorly drained and are on side slopes and slight rises. The Pemberton soils are moderately well drained and somewhat poorly drained and are on slight rises.

The minor soils are well drained Tinton and Fort Mott soils, moderately well drained Woodstown and

Hammonton soils, and poorly drained Fallsington and Mullica soils.

This unit is used mainly for field crops and woodland. Nearly all the Holmdel and Pemberton soils and some of the Shrewsbury soils have been cleared and are used for field crops, mainly soybeans and corn. The remaining Shrewsbury soils are wooded. Some of the acreage has been drained. There are some swampy undrained areas. Wetness is the main limitation of these soils for farming and for most other purposes. Flooding and ponding are common in winter and spring, especially on the Shrewsbury soils. The potential for development of wetland wildlife habitat is good.

12. Klej-Atsion-Evesboro

Nearly level to strongly sloping, deep, excessively drained and moderately well drained to poorly drained soils with a sandy subsoil and substratum; on terraces and uplands

The soils in this unit are on recent deposits of sand.

This unit makes up about 10 percent of the county. The unit is about 30 percent Klej soils, 20 percent Atsion soils, 15 percent Evesboro soils, and 35 percent soils of minor extent.

The Klej soils are moderately well drained or somewhat poorly drained and are nearly level. They are on slight rises and side slopes. The Atsion soils are poorly drained and nearly level. They are on broad flats and in depressions. The Evesboro soils are excessively drained and nearly level to strongly sloping. They are on ridgetops and higher positions on the landscape.

The minor soils are excessively drained Lakewood soils, well drained Fort Mott soils, moderately well drained and somewhat poorly drained Lakehurst soils, frequently flooded Humaquepts, very poorly drained Mullica soils, and Urban land.

Most of this unit is wooded, in native vegetation, and in urban or recreational uses. Droughtiness and wetness are the main limitations for farming or urban uses. Ponding or flooding sometimes occur on the Atsion soils.

Even if drained this unit is poorly suited to crops or urban uses. The potential for development of wetland wildlife habitat is good on the Klej and Atsion soils and poor on the Evesboro soils.

13. Humaquepts-Manahawkin-Mullica

Nearly level, deep, somewhat poorly drained to very poorly drained soils with a loamy or mucky subsoil and a loamy or sandy substratum; on flood plains and uplands

This unit makes up about 4 percent of the county. The unit is about 40 percent frequently flooded Humaquepts, 25 percent Manahawkin soils, 15 percent Mullica soils, and 20 percent soils of minor extent.

The Humaquepts soils are somewhat poorly drained to very poorly drained and are on flood plains of the major streams in the county. The Manahawkin soils are very poorly drained, are high in organic matter content, and are in bogs and depressions along streams throughout the Coastal Plain part of the county. The Mullica soils are very poorly drained are in broad flats and low-lying positions.

The minor soils are poorly drained Atsion and Fallsington soils, moderately well drained to somewhat poorly drained Klej soils, and moderately well drained Hammonton soils.

This unit is used mainly for recreation. Most of the area is swampy, and much of it is wooded. Nearly all of it is undrained. Flooding and ponding are common in winter and spring. Wetness is a limitation for residential development and other urban uses. The potential for development of wetland wildlife habitat is good.

14. Sulfaquents-Sulfihemists-Psamments

Nearly level, deep, excessively drained to very poorly drained mineral and organic soils with a grayish or black subsoil; on tidal flats

This unit makes about 4 percent of the county. The unit is about 32 percent Sulfaquents, 32 percent Sulfihemists, 30 percent Psamments, and 6 percent soils of minor extent.

The Sulfaquents and Sulfihemists are poorly drained or very poorly drained. The Psamments are excessively drained to somewhat poorly drained.

The minor soils are poorly drained Atsion soils and very poorly drained Mullica soils.

Salt-tolerant grasses cover most of this unit. The dominant use is habitat for waterfowl. The Sulfaquents and Sulfihemists on tidal flats have been extensively ditched for better navigation and to reduce mosquito breeding. Dredgings from the South River and the Raritan River have been deposited adjacent to the waterway.

Detailed Soil Map Units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and Management of the Soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Sassafras sandy loam, 2 to 5 percent slopes, is one of several phases in the Sassafras series.

Some map units are made up of two or more major soils. These map units are called soil complexes, soil associations, or undifferentiated groups.

A *soil complex* consists of two or more soils, or one or more soils and a miscellaneous area, in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Boonton-Urban land complex, 0 to 5 percent slopes is an example.

An *undifferentiated group* is made up of two or more soils that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils in the mapped areas are not uniform. An area can be made up of only one of the major soils, or it can be made up of all of them. Sulfaquents and Sulfahemists, frequently flooded, is an undifferentiated group in this survey area.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Urban land is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

Soil Descriptions

At—Atsion sand. This soil is nearly level and poorly drained. It is along drainageways, in basins, and in low-lying flats. The areas are throughout the southern part of the county. They are irregular in shape and range from 6 to 200 acres.

Typically, the surface is covered by a layer of loose leaves and peat 2 inches thick. The surface layer is black sand 4 inches thick. The subsurface layer is gray sand 12 inches thick. The upper part of the subsoil is dark brown loamy sand 6 inches thick. The lower part of the subsoil is brown sand 14 inches thick. The substratum is brown sand to a depth of 60 inches or more.

Included with this soil in mapping are small areas of frequently flooded Humaquepts and Klej, Lakehurst, Mullica, and Manahawkin soils. Included soils make about up to 20 percent of this map unit. The Humaquepts have a less developed subsoil than this Atsion soil. The Klej and Lakehurst soils are somewhat poorly drained or moderately well drained. The Mullica

soils have more clay in the surface layer and subsoil than this Atsion soil. The Manahawkin soils consist of organic material 16 to 51 inches thick over a sandy substratum.

The permeability of this Atsion soil is moderately rapid in the upper part of the subsoil and rapid in the lower part of the subsoil and in the substratum. The available water capacity is low. Additional water is available from the seasonal water table. The organic matter content is moderate. The root zone is restricted by a seasonal high water table that is close to the surface during the winter and spring and is at a depth of 2 to 4 feet in summer. In unlimed areas the surface layer is extremely acid and the subsoil is very strongly acid. The soil is easily worked. Runoff is slow.

Most of the acreage of this soil is in woodland and a dense understory of highbush blueberries, sweet pepperbush, sheep laurel, and greenbriar.

Wetness limits most types of crop production on this soil unless drainage is used. Open ditches or subsurface drains are the common types. In nearby counties this soil is used extensively for blueberries. Ground-water irrigation ponds commonly are constructed on this soil.

This soil is poorly suited to woodland production, and potential productivity is low. Pitch pine, red maple, black gum, swamp white oak, sweet gum, and willow oak are the common tree species. The seasonal high water table limits the harvesting of trees during winter and spring.

The seasonal high water table limits this soil for most types of community development. The water table, low strength, and a potential frost action are limitations of the soil as a site for onsite septic systems, dwellings with basements, and local roads and streets.

Capability subclass: Vw.

BoB—Boonton loam, 2 to 5 percent slopes. This soil is gently sloping and well drained and moderately well drained. It is on rolling hilltops and side slopes in Carteret, Edison, Woodbridge, Metuchen, and Perth Amboy. Slopes are convex or concave. The areas are irregular in shape and range from 5 to 500 acres.

Typically, the surface layer is dark brown loam 10 inches thick. The upper part of the subsoil is yellowish red and dark reddish brown loam 23 inches thick. The lower part is firm, dark reddish brown sandy loam 7 inches thick. The substratum is dark reddish brown sandy loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of soils with a surface layer of silt loam, soils with slopes of less than 2 percent, and somewhat poorly drained Haledon silt loam. They make up as much as 25 percent of this unit. Also included are small areas of Haledon Variant and Klinesville soils that make up as much as 5 percent of the unit. The soil with a surface layer of silt loam, the Haledon soil, and the Haledon Variant soil are mainly in draws, enclosed depressions, and hillside seep spots. The Klinesville soils are in small isolated spots on side slopes.

The permeability of this Boonton soil is moderate above the firm part of the subsoil and slow in the firm part. The available water capacity is moderate, and runoff is medium. Organic matter content is moderate. Root growth and air and water movement are restricted to a depth of 33 inches by the firm part of the subsoil. The hazard of erosion is moderate. A water table generally is perched for short periods above the fragipan during late winter and early spring. In unlimed areas the surface layer and subsoil are strongly acid.

This soil is suited to cultivated crops and to hay and pasture. Applying lime and fertilizer helps to reduce acidity and improve fertility, and using crop residue on and in the soil maintains organic matter content. Contour tillage, stripcropping, using close-growing crops in the rotation, and establishing grassed waterways where needed are practices that help to control erosion.

The soil is suited to a variety of trees, including yellow-poplar, upland oaks, and white ash. Potential productivity is moderately high. Old field stands are almost all sweetgum and red maple. Potential productivity for those species is fair.

The perched water table and the permeability in the lower part of the subsoil are limitations for community development. Downslope movement of water along the top of the firm part of the subsoil is a hazard to dwellings with basements and to onsite waste-disposal systems.

Capability subclass: IIe.

BoC—Boonton loam, 5 to 10 percent slopes. This soil is sloping and well drained and moderately well drained. It is on rolling side slopes in Perth Amboy, Carteret, upper Edison, and Woodbridge Townships. Slopes are convex or concave. The areas are irregular in shape and range from 5 to 500 acres.

Typically, the surface layer is dark brown loam 8 inches thick. The upper part of the subsoil is yellowish red and dark reddish brown loam 25 inches thick. The lower part is firm, dark reddish brown sandy loam 7 inches thick. The substratum is dark reddish brown sandy loam to a depth of 60 inches or more.

Included with this soil in mapping are areas of somewhat poorly drained Haledon soils, soils with slopes of more than 10 percent, and soils with a surface layer of silt loam. They make up as much as 15 percent of the unit. Also included are small areas of poorly drained Haledon Variant soils and shallow Klinesville soils. They make up as much as 15 percent of the unit. The soil with a surface layer of silt loam, the Haledon soils, and the Haledon Variant soils are mainly in draws and hillside seeps. The Klinesville soils are in small isolated spots on side slopes mainly beside drainageways.

The permeability of this Boonton soil is moderate above the firm part of the subsoil and slow in the firm part. The available water capacity is moderate, and

runoff is medium. Organic matter content is moderate. Root growth and air and water movement are restricted to a depth of 33 inches by the firm part of the subsoil. The hazard of erosion is moderate. A water table generally is perched for short periods above the fragipan during late winter and early spring. In unlimed areas the surface layer and subsoil are strongly acid.

Most areas of this soil are in native vegetation or woodland. Some areas are used for pasture or as sites for housing or industrial uses.

This soil is suited to cultivated crops, such as corn, soybeans, hay, fruit, nursery crops, and vegetables. Contour stripcropping, contour tillage, cover crops, and a crop rotation that consists mostly of hay help to reduce runoff and control erosion. Tilth and organic matter can be maintained by growing cover crops, using crop residue, and using grasses and legumes in the cropping system. Periodic use of lime and fertilizer helps to reduce acidity and improve fertility.

The soil is suited to a variety of trees, and the potential productivity is moderately high. The suitable species are yellow-poplar, upland oaks, and white ash.

The perched water table, the slope, and the slow permeability in the lower part of the subsoil limit this soil for community development, particularly as a site for dwellings with basements, septic disposal systems, and local roads and streets.

Capability subclass: IIIe.

BoD—Boonton loam, 10 to 15 percent slopes. This soil is moderately steep to steep and is well drained and moderately well drained. It is on side slopes and beside drainageways in Perth Amboy, Carteret, upper Edison, and Woodbridge Townships. Slopes are convex or concave. The areas are irregular in shape or long and narrow and range from 5 to 50 acres.

Typically, the surface layer is dark brown loam about 7 inches thick. The upper part of the subsoil is yellowish brown and dark reddish brown loam 20 inches thick. The lower part of the subsoil is dark reddish brown, firm sandy loam 13 inches thick. The substratum is dark reddish brown sandy loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of soils with slopes of more than 15 percent or less than 10 percent and soils in which the surface layer has been partly or completely removed by erosion. They comprise as much as 30 percent of the unit and generally require the same type of management as this Boonton soil. Also included are small areas of Klinesville and Haledon Variant soils that make up as much as 15 percent of the unit. These inclusions are mainly on the slopes adjoining drainageways throughout the unit. The Klinesville soils are shallow to red shale bedrock, and the Haledon Variant soils have seasonal high water table perched at a depth of less than 30 inches.

The permeability of this Boonton soil is moderate above the firm part of the subsoil and slow in the firm part. The available water capacity is moderate, and runoff is rapid. Root growth and air and water movement are restricted to a depth of 30 inches by the firm part of the subsoil. A water table generally is perched for short periods above the firm part of the subsoil during late winter and early spring. In unlimed areas the surface layer and subsoil are strongly acid.

The hazard of erosion makes this soil poorly suited to most cultivated crops. The soil is suited to a variety of trees, including upland oaks, ashes, sweet gum, yellow-poplar, and white ash. The potential productivity is moderately high. Slope and seasonal wetness limit the use of equipment. Erosion control is a management concern during harvesting.

The perched water table, the slope, and the slow permeability in the lower part of the subsoil limit this soil for community development, particularly as a site for dwellings with basements, septic disposal systems, and local roads and streets.

Capability subclass: IVe.

BUB—Boonton-Urban land complex, 0 to 5 percent slopes. This unit mainly consists of nearly level to gently sloping, well drained and moderately well drained soils and areas that are used for urban development. The unit is on rolling hilltops and side slopes in Perth Amboy, Carteret, upper Edison, and Woodbridge Townships. Slopes are gently rolling. The areas are irregular in shape and range from 5 to 300 acres. The soils and urbanized areas are in such an intricate pattern that it was not practical to map them separately.

About 40 percent of this unit is Boonton soils. Typically, they have a surface layer of dark brown loam about 10 inches thick. The upper part of the subsoil is yellowish red and dark reddish brown loam 23 inches thick. The lower part of the subsoil is dark reddish brown, firm loam 7 inches thick. The substratum is dark reddish brown sandy loam to a depth of 60 inches or more.

About 40 percent of this unit is areas covered mainly by concrete, asphalt, buildings, or other impervious surfaces.

Included with this unit in mapping are small areas of Haledon silt loam and another soil that has a surface layer of silt loam; areas of soils that have been covered by more than 20 inches of fill material, commonly from adjacent areas of other Boonton soils that have been cut or graded; and areas where most or all of the original soil has been removed. Those areas comprise as much as 20 percent of the unit. Also included are small areas of Haledon Variant and Klinesville soils. The soil with a surface layer of silt loam and the Haledon and Haledon Variant soils are mainly in draws, in enclosed depressions, and near hillside seeps. The Klinesville soils are in small isolated spots on side slopes.

The permeability in this unit is slow in areas where the soils are relatively undisturbed, and it is variable in areas dominated by cuts, fills, and Urban land. Runoff is slow, and the hazard of erosion is slight. The available water capacity is moderate in the relatively undisturbed areas, and it is low to very low in areas dominated by cuts, fills, and Urban land. Most unlimed areas are very strongly acid.

The undisturbed areas of soils in this unit are mainly in yards and between and around structures. Those areas range from about 500 to 7,000 square feet. The soils in those areas generally are suitable for lawns, shade trees, shrubs, vines, and vegetable gardens. The areas that have been disturbed generally are loamy and have moderate suitability for plants, trees, and grasses.

Capability subclass: not assigned.

ChA—Chalfont silt loam, 0 to 2 percent slopes. This soil is nearly level and somewhat poorly drained. It is on divides, side slopes, and toe slopes near Little Rocky Hill in South Brunswick Township. Slopes are smooth or convex and are uniform. The areas are irregular in shape and range from 5 to 200 acres.

Typically, the surface layer is dark grayish brown silt loam 6 inches thick. The subsoil is yellowish brown, mottled silty clay loam 44 inches thick. The lower 24 inches of the subsoil is very firm. The substratum is olive brown silty clay loam to 60 inches or more.

Included with this soil in mapping are areas of soils with a subsoil more than 60 inches thick, soils with a clayey subsoil, soils with very slow permeability, and moderately well drained soils. They make up as much as 25 percent of the unit and generally require the same management as this Chalfont soil. Also included are small areas of Reaville Variant and Fallsington soils and Humaquepts. They make up as much as 15 percent of the unit. The Fallsington and Reaville Variant soils and Humaquepts are mainly along Heathcote Brook. The water table in those soils is nearer to the surface than that in this Chalfont soil.

The permeability in the subsoil and substratum of this Chalfont soil is slow. Available water capacity is high. Runoff is slow, and the erosion hazard is slight. Root growth and air and water movement are restricted to a depth of 26 inches by the firm part of the subsoil. The water table is perched on the subsoil from late fall to early spring. In unlimed areas the surface layer is extremely acid and the subsoil is very strongly acid. The organic matter content is moderate, and natural fertility is medium.

Drainage and lime and fertilizer are needed to make this soil suitable for most cultivated crops, especially corn and soybeans, or for hay and pasture. Wetness in the spring delays plowing and causes the soil to warm slowly. Conservation tillage, cover crops, grasses and legumes in the cropping system, plowing at the proper moisture content, and using crop residues help to maintain organic matter content and improve tilth. Plowing when the soil is wet causes a crust to form on the surface and results in puddling.

The soil is moderately well suited to woodland. The suitable species are yellow poplar, upland oaks, sweet gum, ash, and red maple. The potential productivity is moderately high. The perched water table limits the use of equipment.

The perched water table and the permeability are the main limitations of this soil for community development. The water table especially limits the soil as a site for dwellings with basements, septic tank filter fields, and local roads and streets.

Capability subclass: IIIw.

ChB—Chalfont silt loam, 2 to 5 percent slopes. This soil is gently sloping and somewhat poorly drained. It is on divides, side slopes, and toe slopes near Little Rocky Hill in South Brunswick Township. Slopes are smooth or concave. The areas are irregular in shape and range from 5 to 200 acres.

Typically, the surface layer is dark grayish brown silt loam 6 inches thick. The subsoil is yellowish brown, mottled silty clay loam 44 inches thick. The lower 24 inches of the subsoil is very firm. The substratum is olive brown silty clay loam to 60 inches or more.

Included with this soil in mapping are small areas of soils with very slow permeability and small areas of Mount Lucas silt loam soil. They make up as much as 15 percent of the unit. These inclusions generally require the same management as this Chalfont soil. Also included are small areas of Mount Lucas very stony silt loam that make up as much as 10 percent of the unit. The Mount Lucas soils are on the lower slopes of Little Rocky Hill. The rest of the inclusions are on the slopes adjoining Heathcote Brook.

The permeability in the subsoil of this Chalfont soil is slow. Available water capacity is high. Root growth and air and water movement are restricted to a depth of 26 inches by the firm part of the subsoil. The organic matter content is moderate, and natural fertility is medium. Runoff is medium, and the erosion hazard is moderate. The water table is perched on the subsoil from late fall to early spring. In unlimed areas the surface layer is extremely acid and the subsoil is very strongly acid.

This soil is moderately well suited to most cultivated crops and to pasture and hay, but most of the acreage is in native vegetation. The soil is suited to such cultivated crops as corn, soybeans, and cabbage and other vegetables. Wetness is the main limitation of this soil. The soil dries and warms slowly in the spring. Because of wetness, the soil cannot be worked early in the spring. Tilth can be maintained or improved by incorporating organic matter into the soil and by plowing when the soil is at the proper moisture content. If worked when wet, this soil tends to crust and puddles form. A suitable drainage system is needed for optimum crop production.

This soil is suited to a variety of trees, including yellow-poplar, upland oaks, sweetgum, ash, and red maple, and the potential productivity is moderately high. The use of timber equipment is limited by seasonal wetness.

The perched water table and the permeability are limitations of this soil as a site for onsite septic systems. The water table is a limitation of the soil as a site for dwellings with basements and for local roads and streets.

Capability subclass: IIIw.

DnA—Downer loamy sand, 0 to 5 percent slopes. This soil is nearly level or gently sloping and is well drained. It is on divides and side slopes mainly in East Brunswick, Monroe, and Sayreville Townships. Slopes are smooth or convex. The areas are generally long and narrow or irregular in shape and range from 10 to 200 acres.

Typically, the surface is covered by a layer of dark brown peat about 2 inches thick. The surface layer is very dark brown loamy sand 2 inches thick. The subsurface layer is very dark brown or strong brown loamy sand 11 inches thick. The subsoil is strong brown sandy loam 17 inches thick. The substratum is strong brown loamy sand to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Fort Mott and Sassafras soils that make up as much as 20 percent of this unit. They generally require the same management as this Downer soil. Also included are small areas of Evesboro and Hammonton soils and Klej soils that have a clayey substratum. They make up as much as 15 percent of the unit. The Evesboro soils require irrigation, and the Hammonton and Klej soils require drainage. The Fort Mott and Evesboro soils are on low knolls throughout the area. The Sassafras, Hammonton, and Klej soils are throughout the mapped areas.

The permeability of this Downer soil is moderate or moderately rapid in the surface layer, subsurface layer, and subsoil. It is rapid in the substratum. Available water capacity is moderate. Organic matter content is low. Tilth is generally good. The root zone extends to a depth of 60 inches. Runoff is slow. The hazard of erosion by water is slight, but the wind erosion hazard is severe in cultivated areas. In unlimed areas the surface layer is extremely acid and the subsoil and substratum are very strongly acid.

Nearly all the acreage of this soil is used for urban development or is in woodland.

This soil is suited to vegetables and fruits. Irrigation is practical for high-value crops. The soil can be kept in good tilth by using cover crops. Lime and fertilizer and organic matter are necessary to make this soil productive. The soil is subject to wind erosion if extensive areas are left without plant cover in winter. Cover crops, wind strips, and windbreaks help to control this erosion. Because of the available water capacity, not much of this soil is used for pasture or hay production.

This soil is suited to trees such as black, white, and scarlet oaks. Pines are common in areas that are in native vegetation. The soil is managed mostly for pines and hardwoods. Potential productivity is moderately high.

Droughtiness in the surface layer is the main limitation of this soil for lawns and landscaping. The major limitation for septic tank absorption fields is the permeability of the substratum.

Capability subclass: IIs.

DnC—Downer loamy sand, 5 to 10 percent slopes. This soil is sloping and well drained. It is on side slopes principally in East Brunswick and Monroe Townships. Slopes are smooth or convex. The areas mainly are long and narrow or irregular in shape and range from 10 to 40 acres.

Typically, the surface is covered by a layer of dark brown peat about 2 inches thick. The surface layer is very dark brown loamy sand 2 inches thick. The subsurface layer is very dark brown or strong brown loamy sand 11 inches thick. The subsoil is strong brown sandy loam 17 inches thick. The substratum is strong brown loamy sand to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Fort Mott soils, Sassafras soils, and soils that are more than 20 percent gravel. Together, they make up as much as 20 percent of the unit, and they generally require the same management as this Downer soil. Also included are small areas of Evesboro soils that make up as much as 15 percent of the unit. The Evesboro soils are more droughty and require more irrigation than does this Downer soil. The Fort Mott soils commonly are on slight ridges or are adjacent to the Evesboro soils. The Sassafras soils and the gravelly soils are common on the upper slopes adjacent to the Sassafras soils.

The permeability of this Downer soil is moderate or moderately rapid. Available water capacity is moderate. Organic matter content and natural fertility are low. The root zone extends to a depth of 60 inches. Runoff is medium. The erosion hazard by water or wind is severe. In unlimed areas the surface layer is extremely acid and the subsoil and substratum are strongly acid.

Most of the acreage of this soil is used for woodland or homesites. A few areas are farmed.

The soil is suited to farming and is suited to vegetables and fruit, but nearly all high-value crops need irrigation. Lime and fertilizer and organic matter are necessary to make this soil productive. Cover crops help to maintain organic matter content. Cover crops, contour farming, and diversion terraces help to control erosion. Because of the available water capacity and the runoff rate, not much of this soil is used for pasture or hay.

This soil is suited to trees. Hardwood stands of oak are common, but pines are common in areas that are in native vegetation or where wildfires have been so severe

that the hardwood trees have been killed. The soil is managed mostly for pines and hardwoods, and potential productivity is moderately high.

The sandy surface limits this soil for recreation uses. The permeability in the substratum is a major limitation of the soil as a site for septic tank absorption fields. Erosion and sedimentation are hazards in areas that have been cleared of trees.

Capability subclass: IIIe.

DoB—Downer sandy loam, 2 to 5 percent slopes. This soil is gently sloping and well drained. It is principally on terraces along drainageways in Monroe, Cranbury, and Plainsboro Townships. Slopes are smooth or convex. The areas generally are long and narrow or irregular in shape and range from 10 to 20 acres.

Typically, the surface layer is dark brown sandy loam 8 inches thick. The subsurface layer is strong brown sandy loam 5 inches thick. The subsoil is strong brown sandy loam 17 inches thick. The substratum is strong brown loamy sand to a depth of 60 inches or more.

Included with the soil in mapping are small areas of Sassafras and Hammonton soils, Downer loamy sands, and soils that are more than 20 percent gravel. Together, they make up as much as 20 percent of the unit, and they generally require the same management as this Downer soil. Also included are small areas of Evesboro soils that make up as much as 15 percent of the unit. They are more droughty than this Downer soil. The Downer loamy sand and the Evesboro soils are near the edges of the unit. The Sassafras soils are near the center of the unit. The Hammonton soil is throughout the unit in depressions and slight draws. The gravelly soil is on the crests of draws and knolls.

The permeability of this Downer soil is moderate or moderately rapid in the surface layer, subsurface layer, and subsoil. It is rapid in the substratum. Available water capacity is moderate. Organic matter content is moderate, and natural fertility is medium. Tilth is good, and this soil is easily worked unless intensive cultivation has caused compaction. The root zone extends to a depth of 60 inches. In unlimed areas the surface layer is extremely acid and the subsoil and substratum are very strongly acid. The hazard of erosion is slight.

This soil is well suited to cultivated crops, especially corn, soybeans, vegetables, and fruit. Irrigation is practical for high-value crops. Planting cover crops and plowing under crop residue help to maintain tilth. Because of the high value of land, not much of this soil is used for pasture or hay.

This soil is well suited to woodland, and potential productivity is moderately high. The dominant species are black, white, and scarlet oak, but pines are common in areas that are in native vegetation. This soil is managed mostly for pines and hardwoods.

The permeability in the substratum causes a hazard of ground-water pollution in areas of this soil used for septic tank absorption fields.

Capability subclass: IIe.

DTB—Downer-Urban land complex, 0 to 10 percent slopes. This unit mainly consists of nearly level to sloping, well drained soils and areas that are used for urban development. The unit is on ridges, terraces, and side slopes mainly in East Brunswick, South River, and Sayreville Townships. Slopes are smooth. The areas are irregular in shape and range from 40 to 200 acres. The soils and urbanized areas are in such an intricate pattern that it was not practical to map them separately.

About 40 percent of this unit is Downer soils. Typically, they have a surface layer of dark brown loamy sand 8 inches thick. The subsurface layer is brown loamy sand 5 inches thick. The subsoil is strong brown sandy loam 17 inches thick. The substratum is strong brown loamy sand to a depth of 60 inches or more.

About 40 percent of this unit is areas covered mainly by concrete, asphalt, buildings, or other impervious surfaces.

Included with this unit in mapping are small areas of Fort Mott and Sassafras soils that make up as much as 10 percent of the unit. They generally require the same management as these Downer soils. Also included are small areas of Evesboro and Hammonton soils; Klej soils with a clayey substratum; areas that have been covered by more than 20 inches of fill material, commonly from adjacent areas of other Downer soils that have been cut or graded; and areas where most or all of the original soil has been removed. Together, they make up as much as 10 percent of the unit. The Evesboro soils require irrigation, and the Hammonton and Klej soils require drainage. The Fort Mott and Evesboro soils are on slight knolls throughout the unit. The Sassafras, Hammonton, and Klej soils are throughout the unit.

The permeability in undisturbed areas of this unit is moderate or moderately rapid. Available water capacity is moderate. Runoff is slow to medium, and the hazard of erosion is slight to moderate. Organic matter content and natural fertility are low. In most unlimed areas the soils are very strongly acid.

The undisturbed areas of soils in this unit are mainly in yards and around and between structures. Those areas range from 500 to 7,000 square feet. The soils and fill in those areas are generally suitable for lawns, shade trees, ornamental trees, shrubs and vines, and vegetable gardens. The areas that have been disturbed generally are sandy and droughty and have poor suitability for plants, trees, and grasses.

Capability subclass: not assigned.

DTD—Downer-Urban land complex, 10 to 15 percent slopes. This unit consists of moderately steep, well drained soils and areas that are used for urban

development. The unit is on ridges, terraces, and side slopes mainly in East Brunswick, South River, and Sayreville Townships. Slopes are smooth and range in length from 100 to 900 feet. The areas are irregular in shape and range from 20 to 40 acres. The soils and urbanized areas are in such an intricate pattern that it was not practical to map them separately.

About 35 percent of this unit is Downer soils. Typically, they have a surface layer of dark brown loamy sand 10 inches thick. The subsoil is strong brown sandy loam 15 inches thick. The substratum is strong brown loamy sand to a depth of 60 inches or more.

About 35 percent of this unit is areas covered mainly by concrete, asphalt, buildings, or other impervious surfaces.

Included with this unit in mapping are small areas of Fort Mott, Sassafras, and Hammonton soils and soils where the slope is more than 15 percent. Together, they make up as much as 20 percent of the unit and generally require the same management as these Downer soils. Also included are small areas of Evesboro and Keyport sandy loam; areas that have been covered by more than 20 inches of fill material, commonly from adjacent areas of the Downer soils that have been cut or graded; and areas where most or all of the original soil has been removed. They make up as much as 10 percent of the unit. The Evesboro soils require irrigation, and the Keyport soils require drainage. The Fort Mott, Sassafras, Evesboro, and Keyport soils are on the higher parts of the slopes. The Hammonton soils are in the slightly lower parts. All are throughout the unit.

The permeability in undisturbed areas of this unit is moderate or moderately rapid. Runoff is rapid, and the erosion hazard is severe. Organic matter content and natural fertility are low. In most unlimed areas the soils are very strongly acid. Available water capacity is moderate in the undisturbed areas, but it is low to very low in the areas that have been excavated or otherwise disturbed.

The undisturbed areas of soils in this unit are mainly in yards and areas around and between structures. Those areas range from 500 to 7,000 square feet. Slope is the main limitation for building sites. The soils and fill material in the undisturbed areas have fair suitability for lawns, shade trees, ornamental trees, shrubs, and vines, and vegetable gardens. The areas that have been disturbed generally are sandy and have poor suitability for plants, trees, and grasses.

Capability subclass: not assigned.

DUA—Dunellen-Urban land complex, 0 to 5 percent slopes. This unit consists of nearly level to gently sloping, well drained soils and areas that are used for urban development. The unit is on glacial outwash terraces mainly in the boroughs of Middlesex and Dunellen. Slopes are smooth. The areas are irregular in shape and range from 9 to 800 acres. The soils and urbanized areas are in such an intricate pattern that it was not practical to map them separately.

About 35 percent of this unit is areas of Dunellen soils. Typically, they have a surface layer of very dark brown sandy loam about 1/2 inch thick. The subsurface layer is dark brown sandy loam about 13 inches thick. The subsoil is dark brown and reddish brown sandy loam 18 inches thick. The substratum is dark brown sandy loam and loamy sand to a depth of 60 inches or more.

About 35 percent of this complex is areas covered mainly by concrete, asphalt, buildings, or other impervious surfaces.

Included with this unit in mapping are small areas of Ellington and Ellington Variant soils and areas where the soil is gravelly or contains gravel strata. They make up as much as 25 percent of the unit and generally require the same management as these Dunellen soils. Also included are small areas of Rowland soils; areas that have been covered by more than 20 inches of fill material, commonly from adjacent areas of other Dunellen soils that have been cut or graded. They make up as much as 5 percent of the unit. The Rowland soils are flooded. They are along the edges of the unit or in drainageways adjacent to streams throughout the unit. Some areas near the borough of Middlesex consist of coarse sand and gravel.

The permeability in the undisturbed areas of this unit is moderate to moderately rapid. Available water capacity is moderate. Runoff is slow, and the erosion hazard is slight.

The undisturbed areas of soils in this unit are mainly in yards and between and around structures. Those areas range from 500 to 7,000 square feet. The soils and fill material in those areas have fair suitability for lawns, shade trees, ornamental trees, shrubs, and vines, and vegetable gardens. The areas that have been excavated or otherwise disturbed generally are sandy and droughty and have poor suitability for grasses, trees, and plants.

Capability subclass: not assigned.

DvA—Dunellen Variant sandy loam, 0 to 2 percent slopes. This soil is nearly level and moderately well drained. It is in intermediate positions in Dunellen and Middlesex Boroughs and South Plainfield Township. The areas are irregular in shape and range from 9 to 150 acres.

Typically, the surface is covered by black muck 2 inches thick. The surface layer and the subsurface layer are brown and pale brown sandy loam and have a combined thickness of about 11 inches. The subsoil is 14 inches thick. It is brown and reddish brown sandy loam that is mottled in the upper part. The substratum is reddish brown sandy loam to a depth of 60 inches or more.

Included with this soil in mapping are areas of Dunellen and Ellington Variant soils and areas where the soil is gravelly or contains thin gravel beds. They make

up as much as 20 percent of the unit and generally require the same management as this Dunellen Variant soil. Also included are small areas of Rowland and Parsippany Variant soils. They make up as much as 10 percent of the unit. The Rowland soils require protection from flooding, and the Parsippany Variant soils require drainage. The Dunellen and Ellington Variant soils are on knolls throughout the unit. The Rowland and Parsippany Variant soils are in drainageways throughout the unit.

The permeability of this Dunellen Variant soil is moderate to moderately rapid. Available water capacity is moderate. Runoff is slow, and the erosion hazard is slight. Tilth is good, and the soil is moderate in organic matter content. The depth of the rooting zone is about 60 inches. The seasonal high water table is 1 to 4 feet below the surface. During years with normal rainfall, the water table is nearest to the surface in winter and is lowest in summer. The surface layer and subsoil commonly are very strongly acid unless lime has been applied.

This soil is used mainly for homesites. Some areas are used for cultivated crops or pasture.

This soil is well suited to cultivated crops, especially irrigated vegetables. Wetness is the main management concern. Alfalfa is short lived because of seasonal wetness. Tilth can be maintained or improved by incorporating organic matter into the soil and by plowing when the soil is at the proper moisture content. The use of lime and fertilizer offsets acidity and increases fertility. Conservation tillage and the use of cover crops and grasses and legumes in the cropping system help to maintain tilth and increase organic matter content and fertility.

Establishing and maintaining a mixture of grasses and legumes and preventing overgrazing are major pasture management concerns on this soil. Controlled grazing, rotation grazing, deferred grazing, and the use of lime and fertilizer and drainage are the main pasture management practices.

This soil is suited to trees. The suitable species are yellow-poplar, black oak, white oak, and pitch pine. Potential productivity is high. Cedars are common in abandoned fields.

The seasonal high water table is the main limitation of this soil for most types of urban development. It especially limits the soil as a site for septic tank filter fields, dwellings with basements, and local roads and streets.

Capability subclass: IIw.

DvB—Dunellen Variant sandy loam, 2 to 5 percent slopes. This soil is gently sloping and moderately well drained. It is in Dunellen and Middlesex Boroughs and South Plainfield and Piscataway Townships. Slopes are concave and convex. The areas are irregular in shape and range from about 9 to 150 acres.

Typically, the surface is covered by black muck 2 inches thick. The surface layer and subsurface layer are brown and pale brown sandy loam and have a combined thickness of about 11 inches. The subsoil is 14 inches thick. It is brown and reddish brown sandy loam that is mottled in the upper part. The substratum is reddish brown sandy loam to a depth of 60 inches or more.

Included with this soil in mapping are areas of Dunellen and Ellington Variant soils and areas where the soil is gravelly or contains thin gravel beds. They make up as much as 20 percent of the unit and generally require the same management as this Dunellen Variant soil. Also included are small areas of Rowland and Parsippany Variant soils. They make up as much as 10 percent of the unit. The Rowland soils require protection from flooding, and the Parsippany Variant soils require drainage. The Dunellen and Ellington Variant soils are on knolls throughout the unit. The Rowland and Parsippany Variant soils are in drainageways throughout the unit.

The permeability of this Dunellen Variant soil is moderate to moderately rapid. Available water capacity is moderate. Runoff is slow, and the erosion hazard is slight. Tilth is good, and the soil is moderate in organic matter content. The depth of the rooting zone is about 60 inches. The seasonal high water table is 1 to 4 feet below the surface. During years with normal rainfall, the water table is nearest to the surface in winter and is lowest in summer. The surface layer and subsoil commonly are very strongly acid unless lime has been applied.

This soil is well suited to cultivated crops, especially irrigated vegetables, but most areas have been drained and are used as sites for houses or industry.

The soil is well suited to trees, but only a small acreage is wooded. Potential productivity is high.

The seasonal high water table is the main limitation of this soil for urban development. Drainage helps to overcome this limitation.

Capability subclass: IIw.

DWA—Dunellen Variant-Urban land complex, 0 to 5 percent slopes. This unit consists of nearly level to gently sloping, moderately well drained soils and areas that are used for urban development. The unit is on glacial outwash terraces in intermediate positions in Dunellen and Middlesex Boroughs and South Plainfield and Piscataway Townships. Slopes are smooth and range in length from 100 to 900 feet. The areas are irregular in shape and range from 20 to 400 acres. The soils and urbanized areas are in such an intricate pattern that it was not practical to map them separately.

About 40 percent of this unit is areas of Dunellen Variant soils. Typically, the surface is covered by black muck 2 inches thick. The surface layer and subsurface layer are brown and pale brown sandy loam and have a combined thickness of about 11 inches. The subsoil is 14 inches thick. It is brown and reddish brown sandy

loam that is mottled in the upper part. The substratum is reddish brown sandy loam to a depth of 60 inches or more.

About 40 percent of this unit is areas covered mainly by concrete, asphalt, buildings, or other impervious surfaces.

Included with this unit in mapping are small areas of Dunellen and Ellington Variant soils and areas where the soil is gravelly or contains gravel strata. They make up as much as 10 percent of the unit and generally require the same management as the Dunellen Variant soils. Also included are small areas of Rowland and Parsippany Variant soils; areas of silt loam above red shale bedrock; areas that have been covered by more than 20 inches of fill material, commonly from adjacent areas of Ellington Variant or Dunellen soils that have been cut or graded; and areas where most or all of the original soil has been removed. These inclusions make up as much as 10 percent of the unit. The Rowland soils require protection from flooding, and the Parsippany Variant soils require drainage. The Dunellen and Ellington Variant soils are on knolls throughout the unit. The Rowland and Parsippany Variant soils are in drainageways throughout the unit. The areas of silt loam are near tributaries of Ambrose Brook.

The permeability of the Dunellen Variant soils is moderate to moderately rapid. Runoff is medium, and the erosion hazard is moderate. Available water capacity is moderate. Most unlimed areas are very acid.

The undisturbed areas of soils in this unit are mainly in yards and between and around structures. Those areas range from 500 to 7,000 square feet. The soils and fill material in those areas have fair suitability for lawns, shade trees, ornamental trees, shrubs and vines, and vegetable gardens. The areas that have been excavated or otherwise disturbed generally are sandy and droughty and have poor suitability for grasses, trees, and plants.

Capability subclass: not assigned.

Ek—Elkton loam. This soil is nearly level and poorly drained. It is in Coastal Plain basins and flats principally in Monroe, Old Bridge, and North Brunswick Townships. Slopes are concave. The areas are irregular in shape and range from about 4 to 200 acres.

Typically, the surface layer is grayish brown loam about 8 inches thick. The subsoil is mostly gray clay loam about 27 inches thick. The substratum is mottled, gray and yellowish brown clay loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Fallsington soils that make up as much as 10 percent of the unit and that generally require the same management as this Elkton soil. Also included are small areas of Keyport, Woodstown, and Hammonton soils that make up as much as 15 percent of the unit and that do not require the degree of drainage that this Elkton soil requires. The Fallsington soils are in low spots or strips. The Keyport, Woodstown, and Hammonton soils are on slight knolls. All of the inclusions are throughout the unit.

The permeability of this Elkton soil is slow. Available water capacity is high. Organic matter content is moderately low. Runoff is slow, and the erosion hazard is slight. The rooting zone extends to a depth of 60 inches. Water is frequently ponded on the soil in late winter and in spring. The seasonal high water table is between the surface and a depth of 1 foot in winter and spring. In unlimed areas the surface layer is extremely acid and the subsoil and substratum mainly are strongly acid. In places the substratum turns extremely acid when excavated.

Most of the acreage of this soil is in woodland. Some areas have been drained and used for cultivated crops and pasture.

Unless drained, this soil is poorly suited to crop production. The major management concerns are wetness, surface crusting, acidity, low fertility, and poor aeration in the subsoil. Undrained areas are wet in most years during planting, and the soil in those areas warms slowly. If the soil is worked when it is wet, large clods form on the surface. Drainage can be accomplished with open ditches or shallow surface drains.

If adequately drained, this soil is suited to pasture. Proper stocking rates, rotation grazing, deferred grazing, and the use of lime and fertilizer are practices that are useful in pasture management.

This soil is suited to trees. The dominant trees are willow, white oak, pin oak, swamp white oak, sweetgum, and red maple. Potential productivity is moderately high. A dense understory of shrubs consists mainly of sweet pepperbush, highbush blueberries, and sheep laurel. Seasonal wetness limits the use of timber equipment several months of the year.

The seasonal high water table, the permeability, and low strength are the main limitations of this soil for urban development. The water table especially limits the soil as a site for septic tank absorption fields, and the low strength is a limitation of the soil as a site for local roads and streets.

Capability subclass: IIIw.

EoA—Ellington Variant sandy loam 0 to 2 percent slopes. This soil is nearly level and moderately well drained. It is on glacial outwash terraces, principally in Piscataway Township, between or around Klinesville soils on hills. The areas of this soil range from 6 to about 300 acres.

Typically, the surface layer is dark brown sandy loam 4 inches thick. The subsurface layer is brown sandy loam 16 inches thick. The subsoil is yellowish red sandy loam 16 inches thick. Red shale bedrock is at a depth of 36 inches.

Included with this soil in mapping are small areas of sandy loam that is less than 20 inches deep to shale

bedrock, Dunellen soils, soils that are gravelly or that contain gravel strata, and soils that have a layer 2 to 6 inches thick of silty clay immediately above the red shale bedrock. These inclusions make up as much as 25 percent of the unit and generally require the same management as this Ellington Variant soil. Also included are small areas of Rowland and Parsippany Variant soils that make up as much as 10 percent of the unit. The Rowland soils require protection from flooding, and Parsippany Variant soils require drainage. The areas that are less than 20 inches deep to red shale bedrock and the Dunellen soils are on slight knolls or near the edges of the unit. The Rowland and Parsippany Variant soils are in drainageways throughout the unit.

The permeability of this Ellington Variant soil is moderate to moderately rapid. Available water capacity is moderate. Runoff is slow. Tilth is good, and the organic matter content is moderate. Roots extend to the rock at a depth of about 36 inches, but a few penetrate into cracks in the rock. In unlimed areas the surface layer and the subsoil commonly are very strongly acid. The hazard of erosion is slight. Red shale bedrock is at a depth of 20 to 40 inches. A seasonal high water table is at a depth of 1 to 3 feet.

Most of the acreage of this soil is in woodland or urban uses.

This soil is suited to cultivated crops and to hay and pasture. The soil is droughty during some growing seasons because of the restricted root zone. Seasonal wetness and the hazard of erosion are the main management concerns. The use of lime and fertilizer helps to offset the acidity and increase fertility. If the soil is cultivated, conservation tillage, the use of cover crops and grasses and legumes in the cropping system, and the use of crop residue help to reduce runoff and control erosion.

Establishing and maintaining a mixture of grasses and legumes and proper grazing are major pasture management concerns. Rotation grazing, deferred grazing, and the use of fertilizer are the main practices of pasture management.

This soil is suited to trees, and potential productivity is moderately high. The main species are water-tolerant oaks, yellow poplar, and sweetgum.

This soil is limited for many urban uses by the seasonal high water table. The water table and a frost-action potential are limitations of the soil as a site for houses with basements, septic tank absorption fields, and local roads and streets.

Capability subclass: IIw.

EoB—Ellington Variant sandy loam, 2 to 5 percent slopes. This soil is gently sloping and moderately well drained. It is on slight knolls on glacial outwash terraces principally in South Plainfield, Edison, and Plainsboro Townships. Slopes are smooth or convex. The areas of this soil range mainly from 30 to 300 acres.

Typically, the surface layer is dark brown sandy loam about 4 inches thick. The subsurface layer is strong brown fine sandy loam 16 inches thick. The subsoil is yellowish red fine sandy loam about 16 inches thick. The red shale bedrock is at a depth of 36 inches.

Included with this soil in mapping are small areas of sandy loam that is less than 20 inches deep to red shale bedrock, Dunellen soils, and soils that are gravelly or that contain strata of gravel. Together, they make up as much as 25 percent of the unit, and they generally require the same management as this Ellingston Variant soil. Also included are small areas of Rowland and Parsippany Variant soils that make up as much as 10 percent of the unit. The Rowland soils require protection from flooding, and the Parsippany Variant soils require drainage. The areas that are less than 20 inches deep to red shale bedrock and the Dunellen soils are on slight knolls or near the edges of the unit. The Rowland and Parsippany Variant are in drainageways throughout the unit.

The permeability of this Ellington Variant soil is moderate to moderately rapid. Available water capacity is moderate. Runoff is medium. Tilth is good, and the organic matter content is moderate. Roots extend to the rock at a depth of about 36 inches, but a few penetrate into cracks in the rock. In unlimed areas the surface layer and the subsoil commonly are very strongly acid. The hazard of erosion is moderate. Red shale bedrock is at a depth of 20 to 40 inches. A seasonal high water table is at a depth of 1 to 3 feet.

Most of the acreage of this soil is in woodland or urban uses.

This soil is suited to cultivated crops and to hay and pasture. The soil is droughty during some growing seasons because of the restricted root zone. Seasonal wetness and the hazard of erosion are the main management concerns. The use of lime and fertilizer helps to offset the acidity and increase fertility. If the soil is cultivated, conservation tillage, the use of cover crops and grasses and legumes in the cropping system, and the use of crop residue help to reduce runoff and control erosion.

This soil is suited to trees, and potential productivity is moderately high. The main species are water-tolerant oaks, yellow-poplar, and sweetgum.

This soil is limited for many urban uses by the seasonal high water table. The water table and a frost-action potential are limitations of the soil as a site for houses with basements, septic tank absorption fields, and local roads and streets.

Capability subclass: IIw.

ESA—Ellington Variant-Urban land complex, 0 to 5 percent slopes. This unit mainly consists of nearly level to gently sloping, moderately well drained soils and areas that are used for urban development. The unit is on glacial outwash terraces principally in South Plainfield,

Dunellen, Piscataway, and Edison Townships. Slopes are smooth and range in length from 100 to 900 feet. The areas are irregular in shape and range from 20 to 400 acres. The soils and urbanized areas are in such an intricate pattern that it was not practical to map them separately.

About 40 percent of this unit is areas of Ellington Variant soils. Typically, they have a surface layer of dark brown sandy loam about 4 inches thick. The subsurface layer is strong brown sandy loam 16 inches thick. The subsoil is yellowish red fine sandy loam 16 inches thick. Red shale bedrock is at a depth of 36 inches.

About 40 percent of this unit is urbanized areas covered mainly by concrete, asphalt, buildings, or other impervious surfaces.

Included with this unit in mapping are small areas of soils that are less than 20 inches deep to red shale bedrock; soils that contain strata of fine gravel or silt loam; and areas that have been covered by more than 20 inches of fill material, commonly from adjacent areas of Ellington Variant or Dunellen soils that have been cut or graded. Together, they make up as much 15 percent of the unit. Also included are small areas of Reaville, Klinesville, Rowland, and Parsippany Variant soils. They make up as much as 5 percent of the unit. The Rowland soils require protection from flooding, and the Parsippany Variant soils require drainage. The Klinesville and Reaville soils and the soils that are less than 20 inches deep to shale bedrock are on slight knolls throughout the unit or on edges of the unit. The Rowland and Parsippany Variant soils are in drainageways throughout the unit. The Ellington soils are throughout the unit.

The permeability in undisturbed areas of this unit is moderate to moderately rapid. Runoff is medium, and the hazard of erosion is moderate. The available water capacity is moderate. Most unlimed areas are very strongly acid.

The undisturbed areas of soils in this unit are mainly around and between structures. Those areas range from 500 to 7,000 square feet. The soils and fill material in those areas are generally suitable for lawns, shade trees, ornamental trees, shrubs and vines, and vegetable gardens. The areas that have been disturbed generally are sandy and droughty and have poor suitability for plants, trees, and grasses.

Capability subclass: not assigned.

EvB—Evesboro sand, 0 to 5 percent slopes. This soil is nearly level or gently sloping and is excessively drained. It is on stream terraces in low positions principally in East Brunswick, Monroe, and Old Bridge Townships. Slopes are convex and are about 40 to 500 feet long. The areas of this soil range mainly from 4 to 150 acres.

Typically, the surface layer of this soil is dark grayish brown sand 3 inches thick. The subsoil is strong brown sand 37 inches thick. The substratum is reddish yellow sand to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Klej, Downer, Lakewood, and Lakehurst soils. These inclusions generally require the same management as this Evesboro soil, and they make up as much as 25 percent of the unit. Also included are small areas of soils with underlying clay beds and frequently flooded Humaquepts. They make up as much as 10 percent of the unit. The soils with underlying clay beds need drainage, and the Humaquepts require protection from flooding. The Klej soils and Humaquepts are in draws and drainageways on the edge of the mapped areas. The Lakehurst and Lakewood soils are on the edges of the mapped areas, mainly on the northwest-facing slopes. The soils with underlying clay beds are at high elevations about midway between the South River and Browntown. The Downer inclusions are on a few slight knolls throughout the unit.

The permeability of this Evesboro soil is rapid in the subsoil and substratum. Available water capacity is low. Organic matter content and natural fertility are low. Tilth is good, and the soil is easily worked. The root zone extends to a depth of 60 inches or more. Runoff is slow. In unlimed areas the surface layer and subsoil commonly are very strongly acid.

This soil is poorly suited to cultivated crops and to hay and pasture, mainly because of the available water capacity. Fertilizers leach rapidly. Wind erosion is a hazard in unprotected areas but can be reduced by the use of cover crops or windbreaks.

This soil is suited to woodland, and most of the acreage is wooded. Potential productivity is moderately high. The common trees are shortleaf pine, Virginia pine, pitch pine, and black, white, and chestnut oaks. Most areas are cut for pulpwood. Protection from fire is the major management concern.

The sand in the surface layer, the permeability, and the available water capacity are the main limitations of the soil for community development. They especially limit the soil as site for sanitary landfills, septic tank absorption fields, lawns and shrubs, picnic areas, camping, and athletic fields.

Capability subclass: VIIs.

EvC—Evesboro sand, 5 to 10 percent slopes. This soil is sloping and excessively drained. It is on side slopes and toe slopes principally in East Brunswick, Monroe, and Old Bridge Townships. Slopes are concave and convex. The areas of this soil range mainly from 4 to 150 acres.

Typically, the surface layer is dark grayish brown sand about 3 inches thick. The subsoil is strong brown sand 37 inches thick. The substratum is reddish yellow sand to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Klej, Downer, Lakewood, and Lakehurst soils and soils

with slopes of more than 10 percent. Together, they make up as much as 25 percent of the unit, and they generally require the same management as this Evesboro soil. Also included are small areas of Klej soils with a clayey substratum. They make up as much as 10 percent of the unit and require drainage to be suitable for most urban uses.

The permeability of this Evesboro soil is rapid in the subsoil and substratum. Available water capacity is low. Runoff is medium, and the wind erosion hazard is severe. The soil is low in organic matter content and natural fertility. The root zone extends to a depth of 60 inches or more. In unlimed areas the surface layer and the subsoil commonly are very strongly acid.

This soil is poorly suited to cultivated crops. It is droughty, and cleared areas are subject to water erosion and soil blowing. Cover crops help to reduce the hazard of water erosion and increase organic matter content. Lime and fertilizer are needed frequently. Fertilizers are easily leached through this porous soil. Most cultivated crops on this soil need supplemental irrigation. The available water capacity makes this soil poorly suited to hay or pasture.

This soil is suited to woodland, and most of the acreage is wooded. Potential productivity is moderately high. The common trees are shortleaf pine, Virginia pine, pitch pine, and black, white, and chestnut oaks. Most areas are cut for pulpwood. Protection from fire is the major management concern.

The main limitations of this soil for community development and recreation uses are the sandy texture, the permeability, the available water capacity, the erosion hazard, and the slope. They especially limit the soil as a site for sanitary landfills, septic tank absorption fields, lawns and shrubs, picnic areas, camping, and athletic fields.

Capability subclass: VIIs.

EvD—Evesboro sand, 10 to 15 percent slopes. This soil is moderately steep and excessively drained. It is on side slopes principally in East Brunswick, Monroe, Old Bridge, and Sayreville Townships. Slopes are concave and convex. The areas of this soil range mainly from 4 to 30 acres.

Typically, the surface layer is dark grayish brown sand about 3 inches thick. The subsoil is strong brown sand 37 inches thick. The substratum is reddish yellow sand to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Evesboro soils with slopes of less than 10 percent or more than 15 percent and small areas of Downer soils. They make up as much as 20 percent of the unit. Also included are small spots of soils with clay beds at a depth of less than 60 inches. They make up as much as 10 percent of the unit, and require drainage to be suitable for most urban uses.

The permeability of this Evesboro soil is rapid in the subsoil and substratum. Available water capacity is low. Wind erosion is severe in cultivated areas. Runoff is moderately rapid. This soil is low in organic matter content. The root zone extends to a depth of 60 inches or more. In unlimed areas the surface layer and the subsoil commonly are very strongly acid.

The soil is poorly suited to crops and pasture. It is limited by slope, drought during the growing season, and the hazard of erosion. Maintaining a permanent cover, such as trees, grass, or shrubs, helps to control runoff and erosion on the soil.

This soil is moderately well suited to trees, and most of the acreage is wooded. Potential productivity is moderately high. The common trees are shortleaf pine, pitch pine, Virginia pine, and black, white, and chestnut oaks. Pulpwood is the common product. Protection from fire is the major management concern.

The slope, the sandy texture, the available water, and the permeability are the main limitations of the soil for community development. The permeability limits use of this soil as a site for septic tank absorption fields. The slope and texture limit the soil for most types of recreation use.

Capability subclass: VIIs.

Fa—Fallsington sandy loam. This soil is level to nearly level and is poorly drained. It is in low-lying flats and basins principally in Cranbury, East Brunswick, South Brunswick, and Monroe Townships. The areas are irregular in shape and range from 5 to 150 acres. Slopes range from 0 to 2 percent and are dominantly 1 percent.

Typically, the surface layer is very dark brown sandy loam about 8 inches thick. The subsoil is mottled and gray and is 19 inches thick. It is sandy loam in the upper 8 inches and sandy clay loam in the lower 11 inches. The substratum is light yellowish brown to yellowish brown loamy sand to a depth of 60 inches or more.

Included with this soil in mapping are small areas of soils that have a surface layer of loam, small areas of Pocomoke soils, and small areas of soils that have olive-colored or gravelly strata. Together, they make up as much as 30 percent of the unit, and they generally require the same management as this Fallsington soil. Also included are small areas of Woodstown and Hammonton soils that make up as much as 10 percent of the unit and are better drained than this Fallsington soil. The Woodstown and Hammonton soils are on slight knolls. The other soils are throughout the unit. Some units that are adjacent to perennial streams are subject to flooding.

The permeability of this Fallsington soil is moderate to moderately rapid. Available water capacity is moderate. Runoff is slow. The seasonal high water table is between the surface and a depth of 1 foot from late fall to late spring. The root zone extends to a depth of about 60 inches but is seasonally restricted by wetness at a depth

of about 25 inches. Organic matter content is moderate. The frost-action potential is high. In unlimed areas the surface layer is extremely acid and the subsoil very strongly acid.

Undrained areas of this soil generally are wooded. The drained areas are used for farming.

Undrained areas of this soil are poorly suited to cultivated crops. Cultivated crops, such as corn, soybeans, tomatoes, and cabbage, can be grown, but providing drainage is the main management concern. Periodic applications of lime and fertilizers help to reduce acidity and improve fertility, and the use of organic matter is needed for optimum production.

Establishing and maintaining a mixture of grasses and legumes, prevention of overgrazing, and providing drainage are major pasture management concerns. Use of proper stocking rates, rotation grazing, deferred grazing, and restricted grazing during wet periods are useful management practices. If the pasture is overgrazed, some of the desirable grasses and legumes die out. Grazing during wet periods cuts and compacts the surface layer.

The soil is suited to trees, and potential productivity is high. This soil is suited to a variety of species, mainly yellow-poplar, upland oaks, sweetgum, beech, and red maple and ash. Seasonal wetness is a major limitation for the use of equipment.

The seasonal high water table is a major limitation of the soil as a site for some urban uses, especially septic systems, dwellings with basements, and roads and streets.

Capability subclass: IIIw.

Fb—Fallsington loam. This soil is level to nearly level and is poorly drained. It is in low-lying flats and basins principally in South Brunswick, Plainsboro, Cranbury, and East Brunswick Townships. The areas are irregular in shape and range from 5 to 150 acres.

Typically, the surface is covered by a layer of dark brown peat about 3 inches thick. The surface layer is very dark gray loam about 4 inches thick. The subsoil is mottled and gray and is 23 inches thick. It is loam in the upper part and sandy clay loam in the lower part. The substratum is light yellowish brown to yellowish brown gravelly loamy sand and loamy sand to a depth of 60 inches or more.

Included with this soil in mapping are small areas of soil with a surface layer of silt loam or sandy loam and small areas of Mullica soil. They make up as much as 20 percent of the unit and generally require the same management as this Fallsington soil. Also included are small areas of Woodstown soils that make up as much as 15 percent of the unit. They are better drained than this Fallsington soil. The Mullica soil is mainly in depressions and drainageways. The Woodstown soils and the soils with a surface layer of sandy loam are on slight knolls. The soils with a surface layer of silt loam are throughout the unit.

The permeability of this Fallsington soil is moderate to moderately rapid. Available water capacity is moderate. The frost-action potential is high. The subsoil is slightly sticky and has a moderate shrink-swell potential. The seasonal high water is between the surface and a depth of 1 foot from late fall to late spring. The root zone is restricted to a depth of 25 inches by the wetness. Runoff is slow. Organic matter content is moderate. In unlimed areas the surface layer is extremely acid and the subsoil is very strongly acid.

Unless drained, this soil is poorly suited to cultivated crops. The seasonal high water table and a lack of suitable drainage outlets are major limitations. If drained, this soil is suited to such cultivated crops as corn, soybeans, and hay. This soil warms slowly, which is a limitation for early planting. Tilth can be maintained by the use of cover crops. Liming and fertilizing are needed periodically for optimum crop production.

Most areas of this soil that are used for pasture require surface drainage. The soil is too wet for grazing from late fall to late spring. Establishing and maintaining a mixture of grasses and legumes and the prevention of overgrazing are major management concerns. Grazing when the soil is wet readily compacts the surface layer. Use of proper stocking rates, rotation grazing, deferred grazing, and restricted grazing during wet periods are the chief management needs.

The soil is suited to a wide variety of trees, and the potential productivity is high. The main suitable species are pin oak, white oak, swamp oak, sweetgum, beech, red maple, and ash. Wetness limits the use of equipment in late winter if the soil is not frozen.

The seasonal high water table is a major limitation of this soil for urban use, especially as sites for septic systems, dwellings with basements, and roads and streets.

Capability subclass: IIIw.

Fd—Fallsington Variant loam. This soil is level to nearly level and is poorly drained. It is in low-lying flats and basins principally in North Brunswick and Edison Townships. The areas are irregular in shape and range from 5 to 150 acres.

Typically, the surface layer is gray loam about 5 inches thick. The subsoil is 24 inches thick. It is gray silt loam in the upper part and weak red clay loam in the lower part. The substratum extends to a depth of 60 inches or more. It is brownish gray, yellowish brown, and dark gray stratified sandy loam and loamy sand or loam.

Included with this soil in mapping are areas of soils with a surface layer of silt loam, Elkton soils, soils that have red shale in the subsoil, gravelly or cobbly soils, and soils that have a loamy substratum. Together, they make up as much as 25 percent of the unit, and they generally require the same management as this

Fallsington Variant soil. Also included are small areas of Nixon Variant soils that make up as much as 15 percent of the unit. They are better drained than this Fallsington Variant soil. The soils with a surface layer of silt loam and the Elkton soils are near the middle of the map unit. The gravelly and cobbly soils are near drainageways and on slight knolls. The Nixon Variant soils are on slight knolls. The other inclusions are commonly near the edges of the map unit.

The permeability of this Fallsington Variant soil is slow in the subsoil. Available water capacity is high. The root zone generally extends to a depth of 60 inches or more but is seasonally restricted by wetness to a depth of about 25 inches. This soil is subject to a severe frost-action potential. The subsoil has a moderate shrink-swell potential. The seasonal high water table is between the surface and a depth of 1 foot from late fall to late spring. Runoff is slow, and the erosion hazard is slight. Organic matter content is moderate. In unlimed areas the surface layer is extremely acid and the subsoil is very strongly acid. Areas of this soil that are near streams are frequently flooded for brief periods in winter, spring, and early summer.

This soil is poorly suited to cultivated crops and to hay and pasture. Flooding and the seasonal high water table are the main limitations. Providing drainage is the main management concern. The use of lime and fertilizers reduces acidity and maintains fertility. If the soil is cultivated, using cover crops, using crop residue on or in the soil, and using grasses and legumes help to increase organic matter content and maintain tilth.

Establishing and maintaining a mixture of grasses and legumes, prevention of overgrazing, and providing drainage are major pasture management concerns. Using proper stocking rates, rotation grazing, deferred grazing, and restricted grazing during wet periods are the main management practices. If the pasture is overgrazed, some of the desirable grasses and legumes die out, and grazing during wet periods cuts and compacts the surface layer.

The soil is suited to trees, and most of the acreage is wooded. Potential productivity is high. The common species are pin oak, willow oak, scarlet oak, red oak, sweetgum, and red maple. Seasonal wetness and flooding limit the use of timber equipment.

The seasonal high water, flooding, and the slow permeability of the subsoil are major limitations for community development. The seasonal high water table and the slow permeability especially limit the soil as a site for septic systems, dwellings with basements, and local roads and streets.

Capability subclass: IIIw.

FrB—Fort Mott loamy sand, 0 to 5 percent slopes. This soil is nearly level or gently sloping and is well drained. It is mainly on divides and side slopes in East Brunswick Township. It also is on stream terraces in Monroe, Plainsboro, and Cranbury Townships. Slopes are concave or convex. The areas generally are long and narrow and range from 10 to 200 acres.

Typically, the surface layer is dark grayish brown loamy sand 8 inches thick. The subsurface layer is yellowish brown loamy sand 17 inches thick. The subsoil is yellowish brown sandy loam 10 inches thick. The substratum is very pale brown sand to a depth of 60 inches or more.

Included with this soil in mapping are small areas of soils where the upper layers of loamy sand are more than 25 inches thick, soils with slopes of more than 5 percent, and soils that contain thin beds of gravel. Together, they make up as much as 15 percent of the unit, and they generally require the same management as this Fort Mott soil. Also included are small areas of Evesboro and Hammonton soils that make up as much as 10 percent of the unit. The Evesboro soils are more droughty than this Fort Mott soil, and the Hammonton soils are not so well drained. The soils that have the thick upper layers and the Evesboro soils commonly are on slight knolls. The Hammonton soils commonly are in slight depressions and drainageways.

The permeability of this Fort Mott soil is moderate or moderately rapid in the upper layers and rapid in the substratum. Available water capacity is low in the surface and subsurface layers and moderate in the subsoil. Runoff is slow, and the erosion hazard is slight. Organic matter content is low. Tilth is good. The rooting zone extends to a depth of 60 inches. In unlimed areas the surface and subsurface layers are extremely acid, and the subsoil and substratum are very strongly acid.

The soil is suited to cultivated crops. Vegetables and fruit are common on this soil, but irrigation is needed for high-value crops. The soil can be kept in good tilth by planting cover crops that maintain the organic matter content. Periodic use of lime and fertilizers is needed for optimum production. The soil is subject to wind erosion if extensive areas are left bare in winter. Cover crops, wind strips, or windbreaks help control such erosion.

Because of the available water capacity, not much of this soil is used for pasture or hay. Proper seeding, use of proper stocking rates, and rotation grazing are the major pasture management practices.

This soil is well suited to trees, and most areas are wooded (fig. 3). Potential productivity is moderately high. Black oak, white oak, and scarlet oak are the common species, but Virginia pines are common in unused fields. The soil is managed for pines and hardwoods.

The rapid permeability in the substratum causes a hazard of ground-water pollution in areas of this soil used for waste disposal.

Capability subclass: IIIs.

HaA—Haledon silt loam, 0 to 2 percent slopes. This soil is nearly level and somewhat poorly drained. It is on side slopes and toe slopes in Carteret, Edison,

Figure 3.—Christmas trees on Fort Mott loamy sand, 0 to 5 percent slopes.

Woodbridge, and Perth Amboy. Slopes are convex or concave. The areas are irregular in shape and range from 3 to 100 acres.

Typically, the surface layer is dark brown silt loam about 8 inches thick. The subsoil is 52 inches thick. The upper 16 inches of the subsoil is brown and dark brown, mottled silt loam. The lower 36 inches is a brittle, compact layer of reddish brown sandy loam. The substratum is below a depth of 60 inches and is reddish brown gravelly sandy loam.

Included with this soil in mapping are small areas of Boonton soils and soils with a surface layer of loam. They make up as much as 25 percent of the unit and generally require the same management as this Haledon soil. Also included are small areas in which red shale bedrock is at a depth of less than 60 inches and small areas of Haledon Variant soils. They make up as much as 5 percent of the unit. The Haledon Variant soils are more poorly drained than this Haledon soil. The areas underlain by red shale bedrock are commonly beside draws and drainageways. The Haledon Variant soils are commonly around hillside seeps or in draws or small depressions. The Boonton soils are throughout the map unit.

The permeability of this Haledon soil is moderate above the brittle part of the subsoil and slow in the brittle part. Available water capacity is moderate. A seasonal high water table is perched above the brittle part of the subsoil during late winter and early spring but only for short periods. Organic matter content is moderate. The root zone extends to a depth of 24 inches. In unlimed

areas the surface layer and subsoil commonly are strongly acid.

This soil is moderately well suited to cultivated crops and to pasture and hay. Drainage helps to improve the suitability.

The soil is suited to woodland, and the potential productivity is moderately high. The soil is suited to a variety of trees, including yellow-poplar, upland oaks, beech, and white ash. Stands in fields are almost all sweetgum and red maple. Seasonal wetness limits the use of timber equipment during winter and spring.

The main limitations of this soil for community development are the slow permeability in the lower part of the subsoil and the seasonal high water table. They especially limit the soil as a site for septic systems, dwellings with basements, and local roads and streets.

Capability subclass: IIw.

HaB—Haledon silt loam, 2 to 5 percent slopes. This soil is gently sloping and somewhat poorly drained. It is in Carteret, Edison, Woodbridge, and Perth Amboy. Slopes are convex or concave. The areas are irregular in shape and range from 3 to 100 acres.

Typically, the surface layer is dark brown silt loam about 8 inches thick. The subsoil is 52 inches thick. The upper 16 inches of the subsoil is brown and dark brown, mottled silt loam. The lower 36 inches is a brittle, compact layer of reddish brown sandy loam. The substratum is below a depth of 60 inches and is reddish brown gravelly sandy loam.

Included with this soil in mapping are small areas of Boonton soils, soils with a surface layer of loam, and soils that contain sandy strata. They make up as much as 25 percent of the unit and generally require the same management as this Haledon soil. Also included are small areas in which red shale bedrock is at a depth of less than 60 inches and small areas of Haledon Variant soils. They make up as much as 5 percent of the unit. The Haledon Variant soils are more poorly drained than this Haledon soil. The Boonton soils, the soils with a surface layer of loam, and the areas underlain by red shale bedrock are on slopes. The Haledon Variant soils and the soils with sandy strata are on toe slopes and in small depressions and drainageways.

The permeability of this Haledon soil is moderate above the brittle part of the subsoil and slow in the brittle part. Available water capacity is moderate. A seasonal high water table is perched above the brittle part of the subsoil during late winter and early spring but only for short periods. Organic matter content is moderate. The root zone extends to a depth of 24 inches. In unlimed areas the surface layer and subsoil commonly are strongly acid.

This soil is moderately well suited to cultivated crops and to pasture and hay. Drainage helps to improve the suitability.

The soil is suited to woodland, and the potential productivity is moderately high. The soil is suited to a variety of trees, including yellow-poplar, upland oaks, beech, and white ash. Stands in fields are almost all sweetgum and red maple. Seasonal wetness limits the use of timber equipment during winter and spring.

The main limitations of this soil for community development are the slow permeability in the lower part of the subsoil and the seasonal high water table (fig. 4). They especially limit the soil as a site for septic systems, dwellings with basements, and local roads and streets.

Capability subclass: IIw.

HBB—Haledon-Urban land complex, 0 to 5 percent slopes. This unit mainly consists of nearly level to gently sloping, somewhat poorly drained soils and areas that are used for urban development. The unit is in Carteret, Edison, Woodbridge, and Perth Amboy. It is smooth to sloping. The areas are irregular in shape and range from 20 to 100 acres. The soils and urbanized areas are in such an intricate pattern that it was not practical to map them separately.

About 40 percent of this unit is Haledon soils. Typically, they have a surface layer of dark brown silt loam about 8 inches thick. The subsoil is 52 inches thick. The upper 16 inches of the subsoil is brown, mottled silt loam. The middle 18 inches is reddish brown, firm loam. The lower 18 inches is reddish brown sandy loam. The substratum is below a depth of 60 inches and is dark reddish brown gravelly sandy loam.

About 40 percent of this unit is areas covered mainly by concrete, asphalt, buildings, or other impervious surfaces.

Included with this soil in mapping are small areas of Boonton and Haledon Variant soils; areas of soils that have been covered by more than 20 inches of fill material, commonly from adjacent areas of Boonton soils that have been cut or graded; and areas where most of the original soil has been removed. Together, they make up as much as 15 percent of the unit. Also included are small areas of soils in which red shale bedrock is at a depth of less than 60 inches. They make up as much as 5 percent of the unit. The Haledon Variant soils are more poorly drained than this Haledon soil. The Haledon Variant soils are on toe slopes and in small depressions or around hillside seeps. The Boonton soils are on slight ridges or knolls. The soils that contain red shale bedrock are commonly beside draws and drainageways in Carteret and upper Edison and Woodbridge Townships.

In the undisturbed areas of this unit, the permeability is moderate above the firm part of the subsoil and slow in the firm part. A seasonal high water table is perched above the firm part of the subsoil from late winter to early spring. Runoff is medium to rapid, and the hazard of erosion is slight. Available water capacity is moderate. In most unlimed areas the soils are very strongly acid.

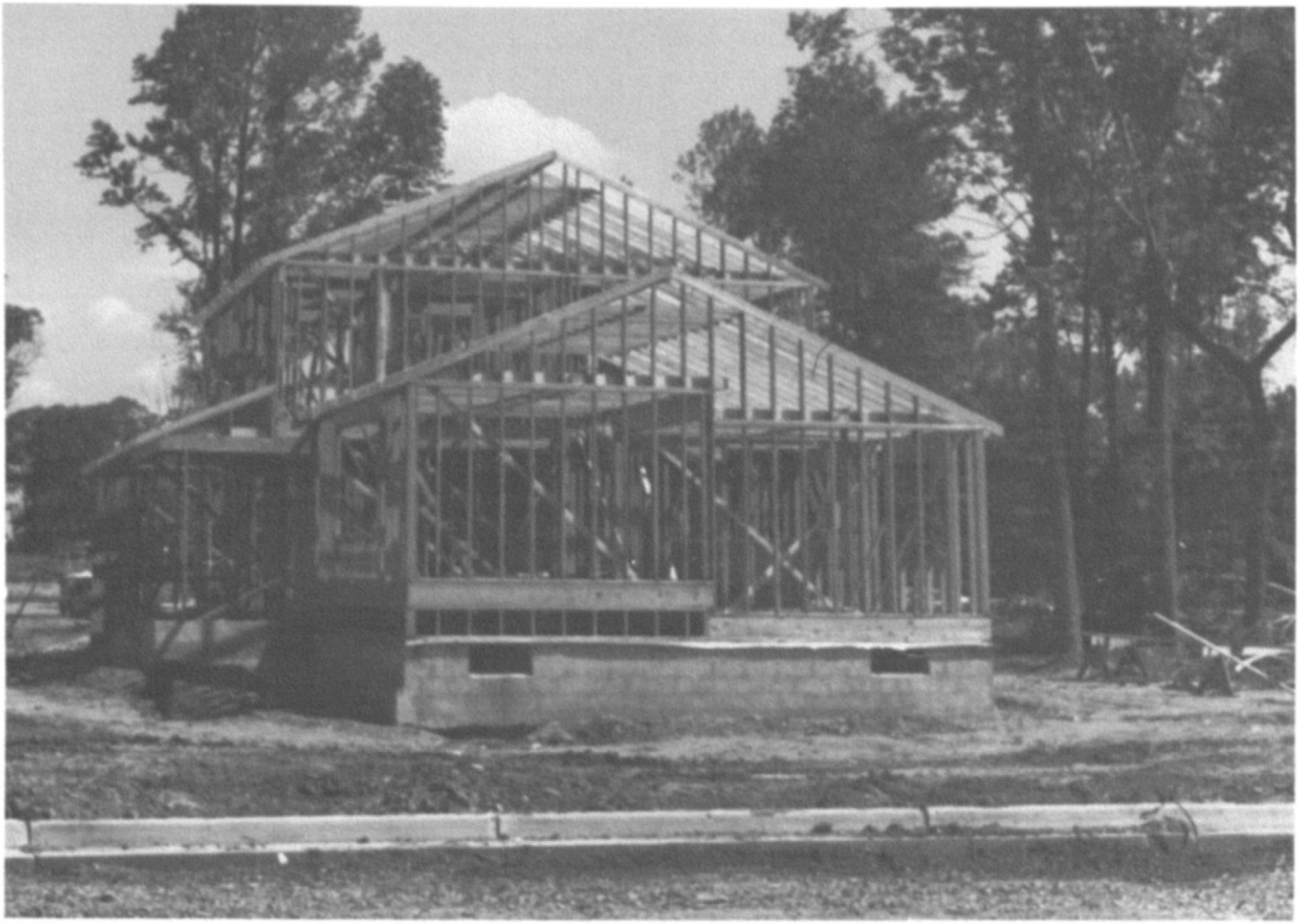

Figure 4.—Housing on Haledon silt loam, 2 to 5 percent slopes. Corrective measures are needed to lower the perched water table.

The undisturbed areas of this unit are mainly between and around structures. The seasonal high water table is the main limitation of the unit as a building site. The soils in those areas are generally suitable for lawns, shade trees, shrubs, vines, and vegetable gardens. The areas that have been disturbed generally are poorly suited to plants, trees, and grasses.

Capability subclass: not assigned.

HcA—Haledon Variant silt loam 0 to 2 percent slopes. This soil is nearly level and poorly drained. It is on toe slopes and flats in Carteret, upper Edison, and Woodbridge Townships. Slopes are smooth or concave. The areas are irregular in shape and range from 3 to 50 acres.

Typically, this soil has a 3-inch-thick layer of peat on the surface. The surface layer is black silt loam 3 inches thick. The subsurface layer is grayish brown silt loam 4 inches thick. The subsoil is 15 inches thick. The upper part of the subsoil is grayish brown and yellowish brown, mottled loam 9 inches thick. The lower part is reddish brown, firm loam 6 inches thick. The substratum is yellowish red loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Parsippany Variant soils and Haledon Variant soils that contain thin sandy strata. They make up as much as 35 percent of the unit and generally require the same management as this Haledon Variant soil. Also included are small areas of Dunellen Variant and Haledon soils and soils in which the depth to red shale bedrock is less than 60 inches. They make up as much as 15 percent of the unit and are better drained than this Haledon Variant soil. The soils that contain sandy strata are on slight knolls throughout the unit. The Dunellen Variant and

Parsippany Variant soils are throughout the unit. The areas that contain red shale bedrock are near the edges of the unit.

The permeability of this Haledon Variant soil is moderate above the firm part of the subsoil and slow in the firm part. The seasonal high water table is perched above the firm part of the subsoil for short periods from late winter to early spring. Available water capacity is moderate. Runoff is slow, and the erosion hazard is slight. Organic matter content is moderate. In unlimed areas reaction is strongly acid in the surface layer and subsoil.

Seasonal wetness makes this soil poorly suited to cultivated crops and to hay and pasture. The soil also is poorly suited to woodland, and potential productivity is moderate. The main suitable trees are pin oak, scarlet oak, willow oak, and red maple. The common species in idle fields are sweetgum and red maple. Seasonal wetness limits the use of timber equipment.

Seasonal wetness and the slow permeability in the firm part of the subsoil are the main limitations of the soil for community development, especially as a site for septic systems, dwellings with basements, and local roads and streets.

Capability subclass: IIIw.

HeA—Hammonton loamy sand, 0 to 3 percent slopes. This soil is nearly level to gently sloping and is moderately well drained. It is on terraces mainly in East Brunswick, Old Bridge, Monroe, and Plainsboro Townships. Slopes are smooth or concave. The areas are irregular in shape and range from 5 to 100 acres.

Typically, the surface layer is brown loamy sand about 8 inches thick. The subsurface layer is yellowish brown loamy sand 10 inches thick. The subsoil is yellowish brown loamy sand 12 inches thick. The substratum is mottled, dark yellowish brown and gray loamy sand to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Downer, Fort Mott, and Woodstown soils and soils with slopes of 3 to 5 percent. Together, they make up as much as 15 percent of the unit. Also included are small areas of Hammonton soils with a clayey substratum. They make up as much as 5 percent of the unit. The Downer, Fort Mott, and Hammonton soils with a clayey substratum are commonly on slight knolls. The Downer and Fort Mott soils also are on stream terraces in Cranbury and Plainsboro Townships. The Woodstown soils are in slight depressions and drainageways.

The permeability of this Hammonton soil is moderate or moderately rapid. Available water capacity is moderate. Organic matter content is low. The seasonal high water table is at a depth of 1.5 to 4 feet. Runoff is slow, and the erosion hazard is slight, but wind erosion is a hazard in winter. In unlimed areas the surface and subsurface layers are extremely acid and the subsoil is very strongly acid.

This soil is used for cultivated crops, woodland, and hay and pasture. Most of the acreage of this soil is or was farmed.

This soil is moderately well suited to cultivated crops, especially corn, soybeans, vegetables, small grain, and hay. Providing drainage is the main management concern. Heavy fertilization is necessary to maintain fertility, and using cover crops and crop residue helps maintain tilth. Cover crops, wind strips, and windbreaks help to control soil blowing.

This soil is suited to pasture. Proper seeding, using proper stocking rates, rotation grazing, and drainage are the major pasture management practices on this soil.

This soil is suited to trees, and potential productivity is high. The soil is suited to black oak, white oak, ash, and beech. The soil is managed mostly for pine and hardwoods.

The seasonal high water table is the main limitation of this soil as a site for community development, especially for septic systems, dwellings with basements, and local roads and streets.

Capability subclass: IIw.

HlA—Hammonton loamy sand, clayey substratum, 0 to 3 percent slopes. This soil is gently sloping and is moderately well drained and somewhat poorly drained. It is on divides, knolls, and side slopes mainly in Old Bridge Township. Slopes are smooth or convex. The areas are irregular in shape and range from 5 to 50 acres.

Typically, the surface layer is brown loamy sand 8 inches thick. The subsurface layer is yellowish brown loamy sand about 10 inches thick. The subsoil is mottled, yellowish brown sandy loam 12 inches thick. The substratum is mottled, gray sandy clay loam to a depth of 52 inches and mottled, dark brown sandy clay to a depth of 60 inches.

Included with this soil in mapping are small areas of soils with a surface layer more than 20 inches thick, soils with slopes of more than 3 percent, and soils with a surface layer of sandy loam. Together, they make up as much as 15 percent of the unit and generally require the same management as this Hammonton soil. Also included in some units are clay beds in the Hammonton soils. They make up as much as 5 percent of the unit. The soils that have a thick surface layer and those that contain clay beds are mainly on knolls between the central and southern parts of Old Bridge Township. The soils with a surface layer of sandy loam are in slight depressions and drainageways.

The permeability of this Hammonton soil is moderate or moderately rapid in the upper 30 inches and slow in the lower part. Available water capacity is moderate. A seasonal high water table is perched above the substratum from late fall to late spring. Runoff is slow, and the erosion hazard is slight. Unprotected cultivated areas are subject to soil blowing in winter. Organic

matter content is low. In unlimed areas the surface and subsurface layers are extremely acid and the subsoil is very strongly acid. In places, the clayey substratum is exposed and is too acid for plants. Such areas generally need a cover of nonacid topsoil 6 to 12 inches thick to support plant growth.

This soil is suited to cultivated crops, and most of the acreage is or was farmed. The common cultivated crops are corn, soybeans, fruit, and hay. If drained, the soil is suitable for tomatoes, cabbage, and other special crops. In places, this soil cannot be worked early because of the seasonal high water table. Drainage can be achieved by open ditches or subsurface drains if the lines are not placed in the substratum. Adding organic matter to the soil helps to maintain tilth. Periodic applications of lime and fertilizer are needed for optimum crop production.

This soil is suited to woodland, and potential productivity is high. The common trees are black oak, red oak, white oak, ash, sweetgum, beech, and red maple. This soil is managed for pine and hardwoods.

The perched seasonal high water table and the slow permeability in the lower part of the soil are the main limitations of the soil for most urban uses. They especially limit the soil as a site for septic systems, dwellings with basements, and local roads and streets. The limitation of the water table can be reduced by ing subsurface drains or open ditches.

Capability subclass: IIw.

HmA—Hammonton sandy loam, 0 to 2 percent slopes. This soil is nearly level and moderately well drained. It is on divides and terraces mainly in East Brunswick, South Brunswick, Monroe, and Plainsboro Townships. Slopes are smooth or convex. The areas are long and narrow and range from 5 to 60 acres.

Typically, the surface layer is brown sandy loam about 8 inches thick. The subsurface layer is yellowish brown sandy loam 10 inches thick. The subsoil is mottled, yellowish brown sandy loam 12 inches thick. The substratum is mottled, dark yellowish brown loamy sand to a depth of 60 inches or more.

Included with this soil in mapping are small areas of soils that have gravelly strata and a surface layer of loam or loamy sand and areas of Klej, Downer, and Woodstown soils. Together, they make up as much as 15 percent of the unit, and they generally require the same management as this Hammonton soil. Also included are small areas of Hammonton soils that are underlain by clay beds. They make up as much as 5 percent of the unit and are in shallow pockets and draws. The other inclusions are throughout the unit.

The permeability of this Hammonton soil is moderate or moderately rapid. Available water capacity is moderate. Organic matter content is moderate. Runoff is medium, and the erosion hazard is moderate. The root zone extends to a depth of 60 inches but is restricted by a seasonal high water table of a depth of about 30 inches from late fall to late spring. In unlimed areas the surface and subsurface layers are extremely acid and the subsoil is very strongly acid.

Most of the acreage of this soil is used for cultivated crops. A few areas are in woodland and pasture. Some areas are in urban uses.

This soil is suited to such cultivated crops as corn, soybeans, tomatoes, cabbage, and other vegetables and to small grain and hay and pasture. The seasonal high water table limits the suitability for early-season vegetables. Providing drainage helps to improve the suitability for crops. Planting cover crops and plowing under crop residue will help to maintain tilth and organic matter content. If this soil is cultivated, conservation tillage and the use of cover crops and grasses and legumes in the cropping system are practices that help to reduce runoff, control erosion, and maintain tilth. Periodic applications of lime and fertilizer help to reduce acidity and improve fertility and are needed for optimum production of crops.

This soil is suited to pasture. Establishing and maintaining a mixture of grasses and legumes, preventing overgrazing, and providing artificial drainage are major pasture management concerns. The use of proper stocking rates, rotation grazing, deferred grazing, and restricted grazing during wet periods are the main management practices. If the pasture is overgrazed, some of the desirable grasses and legumes die, and grazing during wet periods cuts and compacts the surface layer.

This soil is well suited to trees, and potential productivity is high. Black oak, white oak, yellow poplar, sweetgum, beech, and red maple are the common species.

The seasonal high water table limits this soil for most urban uses, especially as a site for dwellings with basements, septic systems, recreation areas, and sanitary landfills.

Capability subclass: IIw.

HoA—Holmdel fine sandy loam, 0 to 2 percent slopes. This soil is nearly level and is moderately well drained and somewhat poorly drained. It is on terraces in Monroe Township. Slopes are concave or convex. The areas range mainly from 5 to 100 acres.

Typically, the surface layer is dark brown fine sandy loam about 10 inches thick. The subsurface layer is yellowish brown fine sandy loam 4 inches thick. The subsoil is 28 inches thick. The upper 24 inches of the subsoil is mottled, yellowish brown fine sandy loam. The lower 4 inches is mottled, dark yellowish brown sandy loam. The substratum extends to a depth of 60 inches or more. It is stratified greenish gray and yellowish red sandy clay loam.

Included with this soil in mapping are small areas of Woodstown soils and Holmdel soils that are olive colored, that have a surface layer of sandy loam, and

that have slopes of more than 2 percent. Together, they make up as much as 15 percent of the unit, and they generally require the same management as this Holmdel soil. Also included are small areas of Shrewsbury and Keyport soils that are more poorly drained than this Holmdel soil. They make up as much as 15 percent of the unit. The Keyport soils are on the terraces near Matchaponix Brook. The soils with slopes of more than 2 percent mainly are at or near the edges of the unit. The Shrewsbury soils are in small shallow depressions and drainageways throughout the unit. The Woodstown soils and the olive-colored soils are throughout the unit.

The permeability of this Holmdel soil is moderate. Available water capacity is high. A seasonal high water table is at a depth of 6 inches to 4 feet from winter to spring. Runoff is slow, and the erosion hazard is slight. Organic matter content is moderate. The root zone extends to a depth of about 60 inches. Unlimed areas are very strongly acid throughout.

This soil is well suited to cultivated crops and to pasture and hay. The common crops are corn, soybeans, and other vegetables and small grains and hay. Alfalfa is short lived because of seasonal wetness. For optimum crop production, this soil needs drainage, mainly by subsurface drains or open ditches. Planting cover crops and plowing under crop residue help to maintain tilth and organic matter content. The periodic use of lime and fertilizer helps to reduce acidity and improve fertility.

The use of proper stocking rates, rotation grazing, deferred grazing, and the use of lime and fertilizer are the main practices used for pasture management. Deferred grazing is needed during some abnormally wet periods. Subsurface drainage or open-ditch drains reduce wetness and make this soil suitable for a wider range of pasture plants.

This soil is well suited to trees, and potential productivity is high. The dominant species are yellow-poplar, red oak, scarlet oak, white oak, black oak, ash, beech, and hickory. Seasonal wetness limits the use of timber equipment during winter and spring.

The seasonal high water table limits this soil as a site for dwellings with basements, for septic systems, for local roads and streets, and for sanitary landfills.

Capability subclass: IIw.

HU—Humaquepts, frequently flooded. This unit consists of nearly level, deep, somewhat poorly drained to very poorly drained soils on flood plains along small, permanent and intermittent streams mainly in the southern part of the county. Slope ranges from 0 to 2 percent.

These soils consist of material that ranges in texture from sandy to clayey. Most of the areas are covered by recent alluvium, mainly loam, and consist of sediments deposited by the stream during flooding. The water covering some areas is several feet deep during flood stage.

Most areas of this unit are in woodland. Flooding and the instability and variability of the soil material make the unit generally unsuitable for crops, pasture, or woodland and for most urban uses.

Capability subclass: Vw.

KeA—Keyport sandy loam, 0 to 2 percent slopes. This soil is nearly level and moderately well drained. It is mostly on divides in Old Bridge Township. Slopes are smooth or convex. The areas are irregular in shape and range from 5 to 100 acres.

Typically, the surface layer is brown sandy loam about 8 inches thick. The subsoil is 32 inches thick. The upper part of the subsoil is yellowish brown sandy loam 7 inches thick. The middle part is yellowish brown sandy clay loam 12 inches thick. The lower part is light brownish gray clay loam 13 inches thick. The substratum is mottled, light brownish gray clay loam to a depth of 60 inches or more.

Included with this soil in mapping are areas of soils that have a surface layer of loamy sand or loam and areas of Woodstown and Hammonton soils with a clayey substratum. They make up as much as 30 percent of the unit and generally require the same management as this Keyport soil. Also included are Klej soils with a clayey substratum. They make up as much as 10 percent of the unit and are more droughty than this Keyport soil. The soils with a surface layer of loam are in slight depressions and draws throughout the unit. The remaining inclusions are throughout the unit, but most are near the edges.

The permeability of this Keyport soil is slow. Available water capacity is high. Organic matter content is moderate. The lower part of the subsoil has a moderate shrink-swell potential. Frost-action potential is high. The root zone extends to a depth of 60 inches or more. The seasonal high water table is at a depth of 1.5 to 4 feet from late fall to late spring. Runoff is slow, and the erosion hazard is slight. In unlimed areas the surface layer is extremely acid and the subsoil is very strongly acid.

This soil is suited to cultivated crops such as corn, soybeans, pumpkins, squash, and other vegetables and to small grains and hay and pasture. The major management concerns are the need to maintain or increase organic matter content and the need for drainage. The soil can be worked fairly early because of the moderately coarse texture of the surface layer. Planting cover crops and plowing under crop residue will help to maintain tilth and organic matter content. The periodic use of lime and fertilizer helps to reduce acidity and improve fertility. Conservation tillage and the use of cover crops and grasses and legumes in the cropping system help to reduce runoff and control erosion. If the substratum is exposed, it commonly becomes too acid

for plant growth. A cover of nonacid topsoil is needed in such areas.

Establishing and maintaining a mixture of grasses and legumes, preventing overgrazing, and providing drainage are major pasture management concerns. Use of proper stocking rates, rotation grazing, deferred grazing, and restricted grazing during wet periods are the main management practices. If the pasture is overgrazed, some of the desirable grasses and legumes die, and grazing during wet periods cuts and compacts the surface layer.

This soil is suited to trees, and potential productivity is high. The common species are yellow-poplar, red oak, white oak, black oak, southern red oak, sweetgum, beech, ash, and red maple. Seasonal wetness limits the use of timber equipment.

The slow permeability, the moderate shrink-swell potential in the subsoil, and the seasonal wetness limit this soil for most urban uses. The permeability limits use of the soil for onsite septic systems. Seasonal wetness limits the soil as a site for dwellings, and frost action limits the soil as a site for local roads and streets. Drainage and surface-water diversion help to reduce wetness and frost action.

Capability subclass: IIw.

KeB—Keyport sandy loam, 2 to 5 percent slopes. This soil is gently sloping and moderately well drained. It is on divides, side slopes, and toe slopes. Slopes are smooth or convex and range in length mainly from 100 to 500 feet. The areas are irregular in shape and range from 5 to 100 acres.

Typically, the surface layer is brown sandy loam about 8 inches thick. The subsoil is 26 inches thick. The upper part of the subsoil is yellowish brown sandy loam 7 inches thick. The middle part is yellowish brown sandy clay loam 12 inches thick. The lower part is light brownish gray clay loam 7 inches thick. The substratum is mottled, light brownish gray clay loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of soils that have a surface layer of loamy sand or loam and areas of Hammonton and Woodstown soils with a clayey substratum. Together, they make up as much as 45 percent of the unit, and they generally require the same management as this Keyport soil. Also included are small areas of Klej soils with a clayey substratum. They make up as much as 10 percent of the unit and are more droughty than this Keyport soil. The soils with a surface layer of loamy sand and the Woodstown, Hammonton, and Klej soils are on slight knolls throughout the unit. The soils with a surface layer of loam are throughout the unit.

The permeability of this Keyport soil is slow. Available water capacity is high. Organic matter content is moderate. The lower part of the subsoil has a moderate shrink-swell potential. Frost-action potential is high. The root zone extends to a depth of 60 inches or more. The seasonal high water table is at a depth of 1.5 to 4 feet from late fall to late spring. Runoff is moderately slow, and the erosion hazard is moderate. In unlimed areas the surface layer is extremely acid and the subsoil is very strongly acid.

This soil is suited to cultivated crops, especially soybeans, pumpkins, and squash and other vegetables and to small grains and hay and pasture. The hazard of erosion and the need to increase organic matter content are major management concerns. Planting cover crops and plowing under crop residue will help maintain tilth and organic matter content. The soil can be worked moderately early because of the moderately coarse texture of the surface layer. Periodic use of lime and fertilizer helps to reduce acidity and improve fertility. Open-ditch drains help to remove seasonal wetness. If the substratum is exposed, it commonly becomes too acid for plant growth. A cover of nonacid topsoil is needed in such areas.

Establishing and maintaining a mixture of grasses and legumes, preventing overgrazing, and providing drainage are major pasture management concerns. Use of proper stocking rates, rotation grazing, deferred grazing, and restricted grazing during wet periods are the main management practices. If the pasture is overgrazed, some of the desirable grasses and legumes die, and grazing during wet periods cuts and compacts the surface layer.

This soil is suited to trees, and potential productivity is high. Yellow-poplar, red oak, white oak, black oak, scarlet oak, sweetgum, beech, ash, black birch, and red maple are common species. This soil is managed primarily for hardwoods.

The slow permeability, the moderate shrink-swell potential in the subsoil, and the seasonal wetness limit this soil for most urban uses. The permeability limits use of the soil for onsite septic systems. Seasonal wetness limits the soil as a site for dwellings, and frost action limits the soil as a site for local roads and streets. Drainage and surface-water diversion help to reduce wetness and frost action.

Capability subclass: IIe.

KeD—Keyport sandy loam, 10 to 15 percent slopes. This soil is moderately steep and moderately well drained. It is on side slopes principally on the bluffs in or near Cheesequake State Park. Slopes are smooth or convex. The areas are irregular in shape and range from 5 to 100 acres.

Typically, the surface layer is brown sandy loam about 4 inches thick. The subsoil extends to a depth of 60 inches or more. The upper part of the subsoil is yellowish brown sandy loam. The middle part is yellowish brown sandy clay loam. The lower part is light brownish gray silty clay loam.

Included with this soil in mapping are small areas of soils with slopes of more than 15 percent, soils with a surface layer of loamy sand, and Woodstown soils with a clayey substratum. Together, they make up as much as 35 percent of the unit, and they generally are managed the same as this Keyport soil. Also included are small areas of Hammonton and Klej soils with a clayey substratum. They make up as much as 15 percent of the unit and are more droughty than this Keyport soil. The included soils are throughout the unit.

The permeability of this Keyport soil is slow. Available water capacity is high. Organic matter content is moderately low. The lower part of the subsoil has a moderate shrink-swell potential. Frost-action potential is high. The root zone extends to a depth of 60 inches or more. The seasonal high water table is at a depth of 2 to 4 feet. Runoff is rapid, and the erosion hazard is severe. In unlimed areas the surface layer is extremely acid and the subsoil is very strongly acid.

Most of the acreage of this soil is used for woodland. A few areas are used for homesites.

This soil is poorly suited to cultivated crops but is better suited to close-growing crops or to pasture and hay than to row crops. The hazard of erosion and the need to increase organic matter content are major management concerns. The use of lime and fertilizer offsets the acidity and increases fertility. Conservation tillage and the use of cover crops and grasses and legumes in the cropping system help to reduce runoff and control erosion in cultivated areas. If the substratum is exposed, it commonly becomes too acid for plant growth. A cover of nonacid topsoil is needed in such areas.

Establishing and maintaining a mixture of grasses and legumes and the prevention of overgrazing are major pasture management concerns. Use of proper stocking rates, rotation grazing, and restricted grazing during wet periods are the main pasture management practices.

This soil is suited to trees, and potential productivity is high. The common species are yellow-poplar, red oak, scarlet oak, white oak, black oak, beech, ash, and black birch. This soil is managed primarily for hardwoods.

The seasonal high water table, the slow permeability, the moderate shrink-swell potential, and the slope limit the soil for many urban uses. The permeability and slope limit the soil as a site for onsite septic systems. The seasonal wetness limits the soil as a site for dwellings with basements, local roads and streets, and some recreation areas.

Capability subclass: IVe.

KfA—Keyport loam, 0 to 2 percent slopes. This soil is nearly level and moderately well drained. It is on high terraces and divides principally in Monroe, Madison, and South Brunswick Townships. Slopes are smooth or convex. The areas are irregular in shape and range from 5 to 100 acres.

Typically, the surface layer is brown loam about 8 inches thick. The subsoil mostly is yellowish brown, mottled clay loam 32 inches thick. The substratum is a firm layer of mottled, grayish brown silty clay loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of soils with a surface layer of sandy loam and areas of Woodstown soils with a clayey substratum. They make up as much as 20 percent of the unit and are generally managed the same as this Keyport soil. Also included are small areas of Elkton loam and soils with a surface layer of loamy sand. They make up as much as 5 percent of the unit. The Elkton soils require more drainage than this Keyport soil, and the soil that is loamy sand requires more irrigation. The soils that have a surface layer of sandy loam or loamy sand and the Woodstown soils with a clayey substratum are on slight knolls and ridges throughout or along the edges of the unit. The Elkton soils are on slight depressions and in drainageways.

The permeability of this Keyport soil is slow. Available water capacity is high. Organic matter content is moderate. The lower part of the subsoil has a moderate shrink-swell potential. Frost-action potential is high. The root zone extends to a depth of 60 inches or more. The seasonal high water table is at a depth of 1.5 to 4 feet from late fall to late spring. Runoff is slow, and the erosion hazard is slight. In unlimed areas the surface layer is extremely acid and the subsoil is very strongly acid.

Most of the acreage of this soil is used for crops and pasture. A few areas are used for homesites.

This soil is suited to cultivated crops such as corn, soybeans, tomatoes, cabbage, and other vegetables and to hay and pasture. Drainage are needed for optimum crop production. The soil cannot be worked early because of the seasonal high water table. Conservation tillage and the use of cover crops and grasses and legumes in the cropping system are practices in cultivated areas that help to reduce runoff, control erosion, and maintain tilth. Using crop residue on the surface and in the plow layer reduces clodding and crusting. Tilling within the proper range of moisture content reduces soil compaction and clodding. Periodic applications of lime and fertilizer help to reduce acidity and improve fertility. If the substratum is exposed, it commonly becomes too acid for plant growth. A cover of nonacid topsoil is needed in such areas.

Overgrazing and grazing when this soil is wet are major concerns of pasture management. If the pasture is grazed when the soil is wet, the surface layer of this soil compacts readily and runoff and erosion increase. Using proper stocking rates, rotation and deferred grazing, and restricted grazing during wet periods are the chief management needs. Periodic applications of lime and fertilizer are needed for optimum production.

This soil is suited to trees, and the potential productivity is high. The soil is suited to a fairly wide variety of trees, mainly yellow poplar, red oak, white oak, scarlet oak, southern red oak, sweetgum, beech, ash, and red maple. Seasonal wetness limits the use of timber equipment.

The main limitations of this soil for urban uses are the seasonal high water table, slow permeability, and high frost-action potential. The permeability limits onsite septic systems. Seasonal wetness limits the soil as a site for dwellings with basements, and the frost-action potential limits the soil as a site for local roads and streets.

Capability subclass: IIw.

KfB—Keyport loam, 2 to 5 percent slopes. This soil is gently sloping and moderately well drained. It is on divides, side slopes, and toe slopes, principally in Monroe, Old Bridge, and South Brunswick Townships. Slopes are smooth or convex. The areas are irregular in shape and range from 5 to 100 acres.

Typically, the surface layer is brown loam about 8 inches thick. The subsoil mostly is yellowish brown, mottled clay loam 32 inches thick. The substratum is a firm layer of mottled, grayish brown silty clay loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of soils with a surface layer of sandy loam or loamy sand and Woodstown soils with a clayey substratum. They make up as much 25 percent of the unit and generally are managed the same as this Keyport soil. Also included are small areas of Elkton soils. They make up as much as 5 percent of the unit and require more drainage than this Keyport soil. The soils with a surface layer of sandy loam or loamy sand and the Woodstown soils are on slight knolls and ridges throughout or along the edges of the unit. The Elkton soils are in slight depressions or drainageways throughout the unit.

The permeability of this Keyport soil is slow. Available water capacity is high. Organic matter content is moderate. The lower part of the subsoil has a moderate shrink-swell potential. Frost-action potential is high. The root zone extends to a depth of 60 inches or more. The seasonal high water table is at a depth of 1.5 to 4 feet from late fall to late spring. Runoff is medium, and the erosion hazard is moderate. In unlimed areas the surface layer is extremely acid and the subsoil is very strongly acid.

Most of the acreage of this soil is used for crops and pasture. Some areas are used for homesites.

This soil is suited to cultivated crops such as corn, soybeans, tomatoes, cabbage, and other vegetables and to hay and pasture. Drainage is needed for optimum crop production. The soil cannot be worked early because of the seasonal high water table. Conservation tillage and the use of cover crops and grasses and legumes in the cropping system are practices in cultivated areas that help to reduce runoff, control erosion, and maintain tilth. Using crop residue on the surface and in the plow layer reduces clodding and crusting. Tilling within the proper range of moisture content reduces soil compaction and clodding. Periodic applications of lime and fertilizer help to reduce acidity and improve fertility. If the substratum is exposed, it commonly becomes too acid for plant growth. A cover of nonacid topsoil is needed in such areas.

Overgrazing and grazing when this soil is wet are major concerns of pasture management. If the pasture is grazed when the soil is wet, the surface layer of this soil compacts readily and runoff and erosion increase. Using proper stocking rates, rotation and deferred grazing, and restricted grazing during wet periods are the chief management needs. Periodic applications of lime and fertilizer are needed for optimum production.

This soil is suited to trees, and the potential productivity is high. The soil is suited to a fairly wide variety of trees, mainly yellow poplar, red oak, white oak, scarlet oak, southern red oak, sweetgum, beech, ash, and red maple. Seasonal wetness limits the use of timber equipment.

The main limitations of this soil for urban uses are the seasonal high water table, the slow permeability, and high frost-action potential. The permeability limits onsite septic systems. Seasonal wetness limits the soil as a site for dwellings with basements, and the frost-action potential limits the soil as a site for local roads and streets.

Capability subclass: IIe.

KfC—Keyport loam, 5 to 10 percent slopes. This soil is sloping and moderately well drained. It is on side slopes principally in Monroe and Old Bridge Township. Slopes are concave or convex. The areas are irregular in shape and range from 5 to 100 acres.

Typically, the surface layer is brown loam about 6 inches thick. The subsoil mostly is yellowish brown, mottled clay loam 32 inches thick. The substratum is a firm layer of mottled, grayish brown silty clay loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of soils with a surface layer of sandy loam and Woodstown soils with a clayey substratum. They make up as much as 30 percent of the unit and generally are managed the same as this Keyport soil. Also included are small areas of soils that have a surface layer of loamy sand and Hammonton soils with a clayey substratum. They make up as much as 15 percent of the unit and are more droughty than this Keyport soil. The soils with a surface layer of sandy loam or loamy sand are on the tops of slopes. The Hammonton and Woodstown soils commonly are in intermediate and upper positions.

The permeability of this Keyport soil is slow. Available water capacity is high. The subsoil has a moderate shrink-swell potential. Organic matter content is

moderate. A seasonal high water table is at a depth of 1.5 to 4 feet. The root zone extends to a depth of 60 inches or more. In unlimed areas the surface layer is extremely acid and the subsoil is very strongly acid. The hazard of erosion is severe.

Most of the acreage of this soil is used for crops and pasture. A few areas are used for homesites.

This soil is suited to such cultivated crops as corn, soybeans, tomatoes, cabbage, and other vegetables and to hay and pasture. The soil cannot be worked early because of the seasonal high water table, and tilth is difficult to maintain. Conservation tillage, contour farming, stripcropping, the use of diversion terraces, and the use of cover crops and grasses and legumes in the cropping system are practices in cultivated areas that help to reduce runoff, control erosion, and maintain tilth. Using crop residue on the surface and in the plow layer reduces clodding and crusting. Tilling when the soil contains the proper moisture content reduces soil compaction and clodding. Periodic applications of lime and fertilizer help to reduce acidity and improve fertility. If the substratum is exposed, it commonly becomes too acid for plant growth. A cover of nonacid topsoil is needed in such areas.

Use of proper stocking rates, rotation grazing, deferred grazing, restricted grazing during wet periods, and periodic use of lime and fertilizer are the chief pasture management needs.

This soil is suited to trees, and the potential productivity is high. The soil is suited to a fairly wide variety of trees, mainly yellow-poplar, red oak, scarlet oak, white oak, black oak, American beech, ash, black birch, and red maple.

The main limitations of this soil for urban use are the seasonal high water table and the slow permeability. The permeability limits the soil for onsite septic systems. The seasonal high water table is a limitation of the soil as a site for dwellings with foundations and for local roads and streets.

Capability subclass: IIIe.

KfD—Keyport loam, 10 to 15 percent slopes. This soil is moderately steep and moderately well drained. It is on side slopes principally in Monroe, East Brunswick, and Old Bridge Townships. Slopes are concave or convex. The areas are irregular in shape and range from 5 to 100 acres.

Typically, the surface layer is brown loam about 4 inches thick. The subsoil mostly is yellowish brown, mottled clay loam 32 inches thick. The substratum is a firm layer of mottled, grayish brown silty clay loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of soils with slopes of more than 15 percent, soils with a surface layer of sandy loam, and Woodstown soils with a clayey substratum. Together, they make up as much as 35 percent of the unit, and they generally are managed the same as this Keyport soil. Also included are small areas of soils that have a surface layer of loamy sand, Hammonton soils with a clayey substratum, and eroded Keyport soils. They make up as much as 15 percent of the unit. The soils with a surface layer of loamy sand and the Hammonton soils are more droughty than this Keyport soil. The inclusions are throughout areas of the unit, mainly in or near Cheesequake State Park.

The permeability of this Keyport soil is slow. Available water capacity is high. The subsoil has a moderate shrink-swell potential. Organic matter content is moderate. A seasonal high water table is at a depth of 1.5 to 4 feet. The root zone extends to a depth of 60 inches or more. In unlimed areas the surface layer is extremely acid and the subsoil is very strongly acid. The hazard of erosion is severe.

Most of the acreage of this soil is used for woodland and recreation. Some areas are used for homesites.

This soil is suited to cultivated crops and is moderately well suited to hay and pasture. The hazard of erosion and the need to increase organic matter content are major management concerns. Conservation tillage and the use of cover crops and grasses and legumes in the cropping system help to reduce runoff and control erosion. Using crop residue on or in the surface layer helps to maintain or increase organic matter content. If the substratum is exposed, it commonly becomes too acid for plants. A cover of nonacid topsoil is needed in such areas.

Use of proper stocking rates, rotation grazing, deferred grazing, restricted grazing during wet periods, and periodic use of lime and fertilizer are the chief pasture management needs.

This soil is suited to trees, and the potential productivity is high. The soil is suited to a fairly wide variety of trees, mainly yellow-poplar, red oak, white oak, black oak, scarlet oaks, sweetgum, beech, ash, black birch, and red maple. Seasonal wetness limits the use of timber equipment during winter and spring.

The main limitations of this soil for urban use are slope, the seasonal high water table, the slow permeability, erosion, and the frost-action potential. The slope, permeability, and water table limit the soil for onsite septic systems. The water table and frost-action potential are limitations of the soil as a site for dwellings with foundations and for local roads and streets.

Capability subclass: IVe.

KGB—Keyport-Urban land complex, 0 to 10 percent slopes. This unit mainly consists of nearly level to sloping, moderately well drained soils and areas that are used for urban development. The unit is on ridges, terraces, and side slopes, principally in Old Bridge and Sayreville Townships. Slopes are smooth to rolling and range in length from 100 to 900 feet. The areas are irregular in shape and range from 20 to 100 acres. The

soils and urbanized areas are in such an intricate pattern that it was not practical to map them separately.

About 35 percent of this unit is Keyport soils. Typically, they have a surface layer of brown sandy loam 8 inches thick. The subsoil is 26 inches thick. The upper part of the subsoil is yellowish brown sandy loam. The middle part is yellowish brown sandy clay loam. The lower part is light brownish gray clay loam. The substratum is mottled, light brownish gray silty clay to a depth of 60 inches or more.

About 35 percent of this unit is areas covered mainly by concrete, asphalt, buildings, or other impervious surfaces.

Included with this unit in mapping are small areas of soils with a surface layer of loamy sand or loam; Woodstown soils with a clayey substratum; areas of soils that have been covered by more than 20 inches of fill material, commonly from adjacent areas of Downer or Evesboro soils that have been cut or graded; and areas where most or all of the original soil has been removed. Together, those areas make up as much as 20 percent of the unit, and they generally are managed the same as this Keyport soil. Also included are small areas of Hammonton and Klej soils with a clayey substratum. They make up as much as 10 percent of the unit and are more droughty than Keyport soils. The soils with a surface layer of loamy sand and the Woodstown, Hammonton, and Klej soils are on slight knolls throughout the unit. The soils with a surface layer of loam are throughout the unit.

The permeability in this unit is slow where the soils are relatively undisturbed, and it is variable in areas dominated by cuts, fills, and Urban land. Runoff is medium, and the hazard of erosion is moderate. The available water capacity is high in the relatively undisturbed areas, and it is low to moderate in areas dominated by cuts and fills. Most unlimed areas are very strongly acid.

The undisturbed areas of soils in this unit are mainly in yards and areas around and between buildings and other structures. Those areas range from about 500 to 7,000 square feet. The soils in those areas have fair suitability for lawns, shade trees, shrubs, vines, and vegetable gardens. Areas that have been deeply excavated commonly are clayey and wet. If the substratum is exposed, it commonly is too acid for plants. A cover of nonacid topsoil is needed in such areas.

Capability subclass: not assigned.

KlA—Klej loamy sand, 0 to 3 percent slopes. This soil is nearly level and moderately well drained or somewhat poorly drained. It is on terraces principally in Monroe, East Brunswick, Old Bridge, and Sayreville. Slopes are smooth or convex. The areas are irregular in shape and range from 5 to 150 acres.

Typically, the surface layer is very dark grayish brown loamy sand about 6 inches thick. The subsoil is mostly yellowish brown, mottled loamy sand 34 inches thick. The substratum is yellowish brown, mottled loamy sand to a depth of 60 inches or more.

Included with this soil in mapping are small areas of soils with slopes of more than 3 percent; Evesboro, Lakewood, and Lakehurst soils; and Klej soils with a clayey substratum. Together, they make up as much as 25 percent of the unit, and they generally require the same management as this Klej soil. Also included are small areas of Atsion soils and Humaquepts, frequently flooded, that are wetter than this Klej soil. They make up about 5 percent of the unit. The Atsion soils and Humaquepts are in drainageways. The other inclusions are throughout the unit but are mainly along the edges of the unit.

The permeability of this Klej soil is rapid, and available water capacity is low. The organic matter content is low. Surface runoff is very slow, and the erosion hazard is slight. The root zone extends to a depth of 60 inches but is seasonally restricted by wetness at a depth of about 36 inches. In unlimed areas the surface layer is extremely acid and the subsoil is very strongly acid. Unprotected areas are subject to soil blowing in winter. The seasonal high water table is at a depth of 1.5 to 2 feet from winter to spring.

This soil has fair suitability for cultivated crops and is not well suited to pasture and hay. Early-spring vegetables and other vegetables commonly are grown. The soil can be worked and planted early in the spring if drained. It is easy to maintain good tilth. If this soil is cultivated, drainage, cover crops, and windbreaks help to promote good root growth, control erosion, and prevent wind erosion. Using crop residue on or in the surface layer helps to increase organic matter content and improve available water capacity. Frequent applications of lime and fertilizer are needed for optimum productivity and to prevent excessive loss of plant nutrients by leaching.

This soil is suited to trees, and potential productivity is moderately high. The suitable species are black oak, white oak, and red maple. Trees on this soil grow slowly because of low available water capacity during the growing season. Seasonal wetness limits the use of timber equipment during winter and spring.

The seasonal high water table and the rapid permeability of the soil are the main limitations for community development. The water table is a limitation of the soil as a site for septic systems and dwellings with basements. The permeability causes a hazard of groundwater pollution in areas used as sites for septic systems. The high content of sand in the soil is a limitation for most recreation uses.

Capability subclass: IIIw.

KmA—Klej loamy sand, clayey substratum, 0 to 3 percent slopes. This soil is nearly level and moderately well drained or somewhat poorly drained. It is on divides

and terraces, principally in East Brunswick, Old Bridge, and Sayreville Townships. Slopes are smooth or convex. The areas are irregular in shape and range from 5 to 100 acres.

Typically, the surface layer is a brown loamy sand about 6 inches thick. The subsoil is 34 inches thick. It is mostly yellowish brown loamy sand that is mottled in the lower part. The substratum extends to a depth of 60 inches or more. It is gray to grayish brown loamy sand to a depth of 48 inches and dark gray clay at a depth of more than 48 inches.

Included with this soil in mapping are small areas of soils with slopes of more than 3 percent, soils with a surface layer of white sand or sandy loam, and soils in which the clay layer is deeper or shallower than in this Klej soil. Together, they make up about 25 percent of the unit, and they generally require the same management as this Klej soil. Also included are small areas of Keyport soils that make up about 5 percent of the unit. These Keyport soils are in slight depressions and are more poorly drained than this Klej soil. The other inclusions are throughout the unit.

The permeability of this Klej soil is rapid in the upper parts, but it is slow to very slow in the clayey part of the substratum. Available water capacity and organic matter content are low. The root zone extends to a depth of 60 inches but is seasonally restricted by wetness at a depth of 36 inches. This soil is subject to frost heaving. The clayey part of the substratum has a moderate shrink-swell potential. A seasonal high water table is perched at a depth of 1.5 to 4 feet from late fall to late spring and during wet periods. Runoff is medium, and the erosion hazard is moderate. In unlimed areas the surface layer is extremely acid and the subsoil is very strongly acid.

This soil has fair suitability for cultivated crops. Early-spring vegetables are the common crop. Crops suffer from wetness during periods of heavy rainfall and from drought during dry periods. The soil can be worked early if drained. It is easy to maintain good tilth. If this soil is cultivated, drainage, cover crops, and windbreaks help to promote good root growth, control erosion, and prevent blowing of the soil. Frequent applications of lime and fertilizer are needed for optimum production.

The soil is suited to trees, and potential productivity is moderately high. The soil is suited to a fairly wide variety of trees, including yellow-poplar, upland oaks, sweetgum, beech, and red maple. Seasonal wetness limits the use of timber equipment during winter and spring.

The seasonal high water table, the low available water capacity, and the slow permeability in the substratum are the main limitations of the soil for community development. The water table and the permeability especially limit the soil as a site for septic systems. Wetness in the substratum is a limitation of the soil as a site for house foundations and roads and streets.

Capability subclass: IIIw.

KUA—Klej clayey substratum-Urban land complex, 0 to 5 percent slopes. This unit mainly consists of nearly level, moderately well drained and somewhat poorly drained soils and areas that are used for urban development. The unit is on divides, terraces, and side slopes, principally in East Brunswick and Old Bridge Townships. Slopes are smooth. The areas are irregular in shape and range from 20 to 400 acres. The soils and urbanized areas are in such an intricate pattern that it was not practical to map them separately.

About 40 percent of this unit is Klej soils. Typically, they have a surface layer of very dark gray loamy sand about 6 inches thick. The subsoil is 34 inches thick. It mostly is yellowish brown loamy sand that is mottled in the lower part. The substratum extends to a depth of 60 inches or more. To a depth of 48 inches it is olive yellow, olive brown, and light gray sand. At a depth of more than 48 inches it is very dark gray clay.

About 40 percent of this unit is areas covered mainly by concrete, asphalt, buildings, or other impervious surfaces.

Included with this unit in mapping are small areas of soils with slopes of more than 5 percent; soils with a surface layer of white sand or sandy loam; soils in which the clayey part of the substratum is at a depth of more or less than 48 inches; areas of soils that have been covered by more than 20 inches of fill material, commonly from adjacent areas of Downer soils that have been cut or graded; and areas where most or all of the original soil has been removed. Together, they make up about 15 percent of the unit. Also included are small areas of Keyport soils that make up about 5 percent of the unit. They are not so well drained as these Klej soils. The Keyport soils are in slight depressions. The remaining inclusions are throughout the mapped areas.

The permeability in this unit is rapid above the clayey part of the substratum and slow to very slow in the clayey part. A seasonal high water table is perched in the subsoil from late fall to late spring. Runoff is medium, and the hazard of erosion is moderate. Available water capacity is low. Most unlimed areas are very strongly acid.

The undisturbed areas of this unit are mainly in yards and between and around structures. Those areas range from about 500 to 7,000 square feet. The seasonal high water table is the main limitation of the soil as a building site. The water table and droughtiness in summer make the soil poorly suited to lawns, shade trees, shrubs and vines, and vegetable gardens. The areas that have been excavated generally are very sandy and droughty.

Capability subclass: VIIs.

KvB—Klinesville shaly loam, 0 to 5 percent slopes. This soil is gently sloping and well drained. It is on ridges, divides, side slopes, and toe slopes, principally in South Brunswick, Piscataway, and Edison Townships.

Slopes are smooth or convex. The areas are irregular in shape and range from 5 to 100 acres.

Typically, the surface layer is dark brown shaly loam about 8 inches thick. The subsoil mostly is dark reddish brown shaly silt loam 4 inches thick. Dark reddish brown shale bedrock is at a depth of 12 inches.

Included with this soil in mapping are small areas of Penn soils and soils with a surface layer of silt loam or loam. They make up as much as 25 percent of the unit and generally require the same management as this Klinesville soil. Also included are small areas of Reaville silt loam that make up as much as 5 percent of the unit. They are not so well drained as this Klinesville soil. The Reaville soil is commonly in drainageways. The other soils are throughout the unit.

The permeability of this Klinesville soil is moderately rapid, and available water capacity is low. This soil is subject to frost heaving. Runoff is slow. The hazard of erosion is slight. Organic matter content is moderate. The rooting depth is restricted by the shale bedrock. In unlimed areas the surface layer and the subsoil are very strongly acid.

This soil is poorly suited to cultivated crops such as corn, soybeans, small grains, and hay. Where the shale content of the surface layer is high, seedbed preparation and cultivation are difficult. Maintaining the organic matter content helps to reduce runoff and erosion. Green-manure crops, cover crops, conservation tillage, and grasses and legumes help to maintain tilth and reduce erosion. Periodic applications of lime and fertilizer are needed for optimum production.

Proper stocking rates, rotation and deferred grazing, and restricted grazing are the chief pasture management needs. Periodic applications of lime and fertilizers are needed for optimum production.

Because of the low available water capacity, this soil is not well suited to woodland. Potential productivity is moderate. Rooting is restricted by the shallow depth to bedrock. Seedling mortality is high because of the shallowness to bedrock and the low available water capacity. The common trees are northern red oak, white oak, and chestnut oak.

This soil is limited for many urban uses because of the depth to bedrock and the content of rock fragments. The bedrock is a major limitation of the soil as a site for septic tank absorption fields, dwellings with basements, and lawns and landscaping. The rock fragment content and depth to bedrock are limitations for most recreation uses.

Capability subclass: IIIe.

KvD—Klinesville shaly loam, 5 to 15 percent slopes. This soil is sloping to moderately steep and is well drained. It is on ridges, divides, side slopes, and toe slopes, principally in Edison, Piscataway, and North Brunswick Townships. The areas are irregular in shape and range from 50 to 100 acres.

Typically, the surface layer is dark brown shaly loam about 8 inches thick. The subsoil mostly is dark reddish brown shaly silt loam 4 inches thick. Dark reddish brown shale bedrock is at a depth of 12 inches.

Included with the soil in mapping are small areas of soils with a surface layer of loam, spots where the shale bedrock is at a depth of less than 12 inches, and small areas where the slope is more than 15 percent. Together, they make up as much as 25 percent of the unit, and they generally are managed the same as this Klinesville soil. Also included are small areas of Nixon and Nixon Variant soils. They make up as much as 5 percent of the unit and are deeper to bedrock than this Klinesville soil.

The permeability of this Klinesville soil is moderately rapid, and available water capacity is low. This soil is subject to frost heaving. Runoff is medium. The hazard of erosion is moderate. Organic matter content is moderate. The rooting depth is restricted by the shale bedrock. In unlimed areas the surface layer and the subsoil are very strongly acid.

This soil is poorly suited to cultivated crops such as corn, soybeans, small grains, and hay. Where the shale content of the surface layer is high, seedbed preparation and cultivation are difficult. Maintaining the organic matter content helps to reduce runoff and erosion. Green-manure crops, cover crops, conservation tillage, and grasses and legumes help to maintain tilth and reduce erosion. Periodic applications of lime and fertilizer are needed for optimum production.

Prevention of overgrazing and grazing when the soil is wet is a major concern of pasture management. Proper stocking rates, rotation and deferred grazing, and restricted grazing are the chief management needs. For optimum production, the level of fertility must be maintained by periodic applications of fertilizer.

Because of the low available water capacity, this soil is not well suited to woodland. Potential productivity is moderate. Rooting is restricted by the shallow depth to bedrock. Seedling mortality is high because of the shallowness to bedrock and the low available water capacity. The common trees are northern red oak, white oak, and chestnut oak.

Slope, the low available water capacity, the depth to bedrock, and rock fragments in the soil limit the soil for most urban uses. The depth to bedrock limits the soil as a site for septic tank absorption fields, dwellings with basements, and lawns and landscaping. The rock fragments and the depth to bedrock are major limitations for most recreation uses.

Capability subclass: IVe.

KvE—Klinesville shaly loam, 15 to 25 percent slopes. This soil is moderately steep to steep and is well drained. It is on side slopes principally in East Brunswick, Piscataway, Edison, and New Brunswick Townships. Slopes are smooth or convex and range in height mainly

from 25 to 70 feet. The areas are irregular in shape and range from 5 to 60 acres.

Typically, the surface layer is dark reddish brown shaly loam about 6 inches thick. The subsoil is dark reddish brown shaly silt loam 6 inches thick. Dark reddish brown shale bedrock at a depth of 12 inches.

Included with this soil in mapping are small areas of soils with slopes greater than 25 percent, some of which are almost vertical bluffs; soils with no surface layer; and areas of exposed bedrock. These inclusions are throughout the unit and make up as much as 45 percent of the unit. They generally are managed the same as this Klinesville soil. Also included are small areas of Nixon and Nixon Variant soils. They make up as much as 20 percent of the unit.

The permeability of this Klinesville soil is moderately rapid. Available water capacity is low. This soil is subject to frost heaving. Organic matter content is moderate. Runoff is rapid, and the hazard of erosion is severe. The rooting depth is restricted by bedrock. In unlimed areas the surface layer is extremely acid and the subsoil is very strongly acid.

The erosion hazard, the available water capacity, and the slope make this soil poorly suited to cultivated crops. The soil is better suited to pasture, hay, trees, and wildlife habitat. Rooting of most types of plants is restricted by the shallow depth to bedrock.

This soil is fairly well suited to trees, and potential productivity is moderate. The rate of seedling mortality is high, and the use of timber harvesting equipment is limited.

The depth to bedrock, the slope, the available water capacity, and the content of rock fragments limit the soil for most urban uses. The bedrock and slope limit the soil as a site for septic tank absorption fields, dwellings with basements, and lawns and landscaping. The rock fragments, slope, and depth to bedrock are major limitations for most recreation uses.

Capability subclass: VIe.

KWB—Klinesville-Urban land complex, 0 to 5 percent slopes. This unit consists of nearly level to gently sloping, well drained Klinesville soils and areas that are used for urban development. The unit is on ridges and side slopes principally in Edison, New Brunswick, South Brunswick, North Brunswick, and Piscataway Townships. Slopes are smooth. The areas are irregular in shape and range from 20 to 400 acres. The soils and urbanized areas are in such an intricate pattern that it was not practical to map them separately.

About 40 percent of this unit is Klinesville soils. Typically, they have a surface layer of dark reddish brown shaly loam about 8 inches thick. The subsoil is dark reddish brown shaly silt loam 4 inches thick. Dark reddish brown shale bedrock is at a depth of 12 inches.

About 40 percent of this unit is areas covered mainly by concrete, asphalt, buildings, or other impervious surfaces.

Included with this unit in mapping are small areas of soils with a surface layer of silt loam or sandy loam; Penn soils; areas of soils that have been covered by more than 20 inches of fill material, commonly from adjacent areas of Downer soils that have been cut or graded; and areas where most or all of the surface layer has been removed. Together, they make up as much as 15 percent of the unit and generally are managed the same as this Klinesville soil. Also included are small areas of Reaville silt loam that make up as much as 5 percent of the unit. They are not so well drained as this Klinesville soil. The Reaville soil is commonly in drainageways. The other soils are throughout the unit.

The permeability in this unit is moderately rapid. Runoff is slow, and the hazard of erosion is slight. Available water capacity is low in the undisturbed areas, and it is low to very low in areas dominated by cuts, fills, and structures. Most unlimed areas are very strongly acid.

The undisturbed areas of soils in this unit are mainly in yards and around and between structures. Those areas range from 500 to 7,000 square feet. The soils and fill in those areas are generally suitable for lawns, shade trees, ornamental trees, shrubs and vines, and vegetable gardens. The areas that have been disturbed generally are sandy and droughty and have poor suitability for plants, trees, and grasses.

Capability subclass: VIIs.

LaA—Lakehurst sand, 0 to 3 percent slopes. This soil is nearly level and moderately well drained or somewhat poorly drained. It is on divides and terraces principally in Monroe, East Brunswick, and Old Bridge Townships. The areas are irregular in shape and range from 5 to 100 acres.

Typically, the surface layer is black sand about 3 inches thick. The subsurface layer is light brownish gray sand 18 inches thick. The upper part of the subsoil is mottled, yellowish red sand 3 inches thick. The lower part of the subsoil is mottled, yellow sand 16 inches thick. The substratum is mottled, light gray sand to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Lakewood and Klej soils, soils with a surface layer more than 24 inches thick, and Lakehurst soils with slopes of more than 3 percent. Together, they make up as much as 20 percent of the unit, and they generally are managed the same as this Lakehurst soil. Also included are small areas of soils that have clay beds at a depth of 40 to 60 inches. They are throughout the unit, principally on side slopes, and they make up as much as 20 percent of the unit.

The permeability of this Lakehurst soil is rapid, and available water capacity is low. The seasonal high water

table is at a depth of 1.5 to 4 feet in late winter and early spring but is generally at a depth of more than 5 feet in summer. Runoff is slow, and the erosion hazard is slight. Natural fertility is very low. Organic matter content is low. The root zone extends to a depth of 60 inches or more. In unlimed areas the surface layer is extremely acid and the subsoil is very strongly acid. Large unprotected areas are subject to wind erosion.

The very low fertility, low available water capacity, and rapid permeability make this soil poorly suited to cultivated crops, pasture, or hay.

This soil is suited to trees, and most of the acreage is wooded. Potential productivity is moderate. The suitable species are chestnut, oak, and pitch pine. The loose, sandy surface layer limits the use of equipment and causes a high rate of seedling mortality. Areas where fires have been frequent are covered mainly by poorly stocked, scrubby stands of pitch pine, blackjack oak, and scrub oak.

The low available water capacity, the seasonal water table, the rapid permeability, and the high sand content are the main limitations of the soil for community development. The seasonal high water table limits the soil as a site for dwellings with basements and for septic tank absorption fields. The permeability causes a hazard of ground-water pollution in areas used for septic tank absorption fields. The high sand content is a limitation for most recreation uses.

Capability subclass: IVs.

LeB—Lakewood sand, 2 to 8 percent slopes. This soil is gently sloping to sloping and is excessively drained. It is on divides and side slopes principally in Monroe, Old Bridge, and Sayreville Townships. Slopes are smooth or convex. The areas are irregular in shape and range from 5 to 50 acres.

Typically, the surface layer is very dark gray sand 3 inches thick. The subsurface layer is light brownish gray sand 17 inches thick. The subsoil is dark yellowish brown and yellowish brown sand 20 inches thick. The substratum is brownish yellow sand to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Evesboro, Lakehurst, and Klej soils; soils with a subsurface layer more than 20 inches thick; and Lakewood soils with slopes of less than 2 percent or more than 8 percent. Together, they make up as much as 20 percent of the unit, and they generally are managed the same as this Lakewood soil. Also included are small areas of soils that have clay beds at a depth of 40 to 60 inches. They make up as much as 5 percent of the unit.

The permeability of this Lakewood soil is rapid. Available water capacity is low. Organic matter content is low, and natural fertility is low. Unless the soil has been limed, the surface layer is extremely acid and the subsoil and substratum are very strongly acid or extremely acid. Runoff is slow. Tilth is good, and the soil is easily worked.

Because of the low fertility, low available water capacity, and rapid permeability, this soil is poorly suited to cultivated crops and pasture. The hazard of water erosion is moderate. If farmed, the soil needs supplemental irrigation and frequent applications of fertilizer. Tilth and organic matter content can be maintained by planting cover crops and using crop residue.

Most of the acreage of this soil is wooded, but the soil is poorly suited to woodland and potential productivity is low. The low available water capacity and low fertility level are the main limitations. Pitch pine, blackjack, post oak, chestnut oak, white oak, and black oak are the common species.

The main limitations of this soil for community development and recreation are the sandy texture, the permeability, and the available water capacity. They limit the soil as a site for sanitary landfills, septic tank absorption fields, lawns, landscaping, picinic areas, campsites, and athletic fields.

Capability subclass: VIIs.

LnA—Lansdowne silt loam, 0 to 2 percent slopes. This soil is nearly level and moderately well drained and somewhat poorly drained. It is on divides and low-lying flats principally in South Brunswick, Piscataway, Edison, and North Brunswick Townships. Slopes are smooth or convex. The areas are irregular in shape and range from 5 to 100 acres.

Typically, the surface layer is dark brown silt loam about 7 inches thick. The upper part of the subsoil is yellowish red silty clay loam 9 inches thick. The middle part is mottled, yellowish red silty clay 20 inches thick. The lower part is mottled, red silty clay 14 inches thick. The substratum is red very shaly silty clay to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Lansdowne Variant soils, soils that are yellow or gray, and soils underlain by stratified sand and gravelly sand. Together, they make up as much as 25 percent of the unit and generally are managed the same as this Lansdowne soil. Also included are small areas of frequently flooded Parsippany soils and Fallsington Variant soils. They are limited by flooding or poor drainage and make up as much as 15 percent of the unit. The area underlain by stratified material and the frequently flooded Parsippany soils are beside drainageways. The other inclusions are throughout the unit.

The permeability of this Lansdowne soil is slow. Available water capacity is high. A seasonal high water table is at a depth of 1 to 2.5 feet from October to June. During years with normal rainfall, the water table starts to rise in October and is nearest to the surface in early spring. It starts to drop in May and is at a depth of 5 feet

or more by August. Organic matter content of the soil is moderate. Runoff is slow, and the erosion hazard is slight. The rooting zone extends to a depth of 60 inches. Unless the soil has been limed, the surface layer is very strongly acid and the subsoil and substratum are strongly acid or very strongly acid. Tilth is fair where the soil has good surface drainage, but the period of optimum moisture content for tilling is short. The soil commonly is too wet or too dry to work easily.

Most of the acreage of this soil is used for cultivated crops and pasture. If drained, this soil is suited to such cultivated crops as corn, soybeans, tomatoes, cabbage and other vegetables. The major management concerns are wetness, surface crusting, soil reaction, fertility level, and poor aeration in the subsoil. Good tilth is difficult to maintain. Additions of organic matter are needed to maintain tilth. Drainage can be accomplished with open ditches or shallow surface drains. Additions of lime and fertilizer and use of crop residue help to reduce acidity and increase organic matter content and fertility.

If drained, this soil is suited to tall grass, some legumes, and bluegrass pasture. Proper stocking rates, rotation and deferred grazing, and the use of lime and fertilizer are the main pasture management practices.

The soil is suited to trees, and potential productivity is moderately high. The soil is suited to a variety of trees, mainly yellow-poplar, upland oaks, sweetgum, beech, and red maple. Seasonal wetness limits the use of timber equipment several months of the year.

The seasonal high water table, the slow permeability, a frost-action potential, and low strength are the main limitations of the soil for community development. The water table especially limits the soil as a site for septic tank absorption fields and dwellings with basements. The low strength limits the soil as a site for local roads and streets.

Capability subclass IIw.

LnB—Lansdowne silt loam, 2 to 5 percent slopes. This soil is gently sloping and moderately well drained and somewhat poorly drained. It is on side slopes and toe slopes. Slopes are smooth or convex and range in length mainly from 100 to 300 feet. The areas are irregular in shape and range from 5 to 100 acres.

Typically, the surface layer is dark brown silt loam about 7 inches thick. The upper part of the subsoil is yellowish red silty clay loam 9 inches thick. The middle part is mottled, yellowish red silty clay 20 inches thick. The lower part is mottled, red silty clay 14 inches thick. The substratum is red very shaly silty clay to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Lansdowne Variant soils, soils that are yellow or gray, and soils underlain by stratified sand or sand and gravel. Together, they make up as much as 25 percent of the unit and generally are managed the same as this Lansdowne soil. Also included are small areas of Klinesville and Parsippany Variant soils. They are limited by flooding or poor drainage and make up as much as 10 percent of the unit. The Lansdowne Variant and Klinesville soils commonly are near the edges of the unit. The soils underlain by stratified material are mainly beside drainageways. The Parsippany Variant soils are in drainageways.

The permeability of this Lansdowne soil is slow. Available water capacity is high. A seasonal high water table is at a depth of 1 to 2.5 feet from October to June. During years with normal rainfall, the water table starts to rise in October and is nearest to the surface in early spring. It starts to drop in May and is at a depth of 5 feet or more by August. Organic matter content of the soil is moderate. Runoff is slow, and the erosion hazard is slight. The rooting zone extends to a depth of 60 inches. Unless the soil has been limed, the surface layer is very strongly acid and the subsoil and substratum are strongly acid or very strongly acid. Tilth is fair where the soil has good surface drainage, but the period of optimum moisture content for tilling is short. The soil commonly is too wet or too dry to work easily.

Most of this soil is used for cultivated crops and pasture. The soil is suited to cultivated crops such as corn, soybeans, and some vegetables. Unless drained, this soil only produces moderate yields of some crops. If this soil is cultivated, conservation tillage and the use of cover crops and grasses and legumes in the cropping system are practices that help to reduce runoff, control erosion, and maintain tilth. The major management concerns are wetness, surface crusting, soil reaction, the fertility level, and poor aeration in the subsoil. Additions of lime and fertilizer are necessary to make this soil productive. Using crop residue reduces the tendency of this soil to clod and crust. Tilling within the proper range of moisture content reduces soil compaction and clodding.

This soil is suited to tall grass, some legumes, and permanent bluegrass pasture. Overgrazing and grazing when the soil is wet are major concerns of pasture management. If the pasture is grazed when the soil is wet, the surface layer compacts easily and runoff and erosion increase. Use of proper stocking rates, rotation and deferred grazing, and restricted grazing during wet periods are the chief pasture management needs.

The soil is suited to trees, and potential productivity is moderately high. The soil is suited to a variety of trees, mainly yellow-poplar, upland oaks, sweetgum, beech, and red maple. Seasonal wetness limits the use of timber equipment several months of the year.

The seasonal high water table, the slow permeability, a frost-action potential, and low strength are the main limitations of the soil for community development. The water table especially limits the soil as a site for septic tank absorption fields and dwellings with basements. The low strength limits the soil as a site for local roads and streets.

Capability subclass: IIe.

LUA—Lansdowne-Urban land complex, 0 to 5 percent slopes. This unit mainly consists of nearly level to gently sloping, moderately well drained and somewhat poorly drained soils and areas that are used for urban development. The unit is on terraces and in draws, principally in South Brunswick and Piscataway Townships. Slopes are smooth. The areas are irregular in shape and range from 20 to 400 acres. The soils and urbanized areas are in such an intricate pattern that it was not practical to map them separately.

About 40 percent of this unit is Lansdowne soils. Typically, they have a surface layer of dark brown silt loam about 7 inches thick. The upper part of the subsoil is yellowish red silty clay loam 9 inches thick. The middle part is mottled, yellowish red silty clay 20 inches thick. The lower part is mottled, red silty clay 14 inches thick. The substratum is red very shaly silty clay to a depth of 60 inches or more.

About 40 percent of this unit is areas covered mainly by concrete, asphalt, buildings, or other impervious surfaces.

Included with this soil in mapping are small areas of soils that have been covered by more than 20 inches of fill material, commonly from adjacent areas of other Lansdowne soils that have been cut or graded; areas where most or all of the original soil has been removed; Lansdowne Variant soils; soils that are yellow or gray; and soils underlain by stratified sand and gravelly sand. Together, they make up as much as 15 percent of the unit, and they generally are managed the same as this Lansdowne soil. Also included are small areas of frequently flooded Parsippany soils and Fallsington Variant soils. They are limited by flooding or poor drainage and make up as much as 5 percent of the unit. The areas underlain by stratified layers and the frequently flooded Parsippany soils are beside drainageways. The other inclusions are throughout the unit.

The permeability in this unit is slow in areas where the soils are relatively undisturbed, and it is variable in areas dominated by cuts, fills, and Urban land. Runoff is slow, and the hazard of erosion is slight. The available water capacity is high in the relatively undisturbed areas, and it is low to very low in areas dominated by cuts, fills, and Urban land. Most unlimed areas are very strongly acid.

The undisturbed areas of soils in this unit are mainly in yards and between and around structures. Those areas range from about 500 to 7,000 square feet. The soils in those areas generally are suitable for lawns, shade trees, shrubs, vines, and vegetable gardens. The areas that have been disturbed mainly are very shaly.

Capability subclass: not assigned.

LvA—Lansdowne Variant silt loam, 0 to 2 percent slopes. This soil is nearly level and moderately well drained and somewhat poorly drained. It is on terraces, in drainageways, and in small depressions at heads of streams, principally in Piscataway, Edison, and South Brunswick Townships. Slopes are smooth or concave. The areas are irregular in shape and range from 5 to 150 acres.

Typically, the surface layer is dark reddish brown silt loam about 9 inches thick. The subsoil is 16 inches thick. The upper part is dark reddish brown silty clay loam 7 inches thick; the lower part is yellowish red silty clay and dark red silt loam 9 inches thick. Fractured red shale bedrock is at a depth of 25 inches.

Included with this soil in mapping are small areas of Lansdowne and Reaville soils, soils containing thin strata of sandy loam, and soils with slopes of more than 2 percent. Together, they make up as much as 35 percent of the unit, and they generally are managed the same as this Lansdowne soil. Also included are small areas of Klinesville and Parsippany Variant soils that make up as much as 10 percent of this unit. The Klinesville soil is shallow to bedrock, and the Parsippany Variant has a seasonal high water table. The Reaville and Klinesville soils and the soils with slopes of more than 2 percent are commonly on or near the edges of the unit. The soils with strata of sandy loam are common on the stream terraces. The Parsippany Variant soils are mainly in drainageways, and the Lansdowne soils are throughout the unit.

The permeability in this Lansdowne Variant soil is slow. Available water capacity is moderate. Organic matter content is moderate. This soil is subject to severe frost heaving. The subsoil has a moderate shrink-swell potential. A seasonal high water table is perched at a depth of 6 inches to 1 foot from late fall to late spring. Runoff is slow, and the erosion hazard is slight. The root zone of most crops extends to bedrock. In unlimed areas the surface layer is extremely acid and the subsoil is very strongly acid.

If drained, this soil is suited to cultivated crops and pasture. The major management concerns are wetness, surface crusting, soil reaction, fertility level, and poor aeration in the subsoil. Drainage can be accomplished with open ditches or shallow surface drains. Additions of lime and fertilizer and use of organic matter improve suitability for crops. Use of proper stocking rates, rotation grazing, deferred grazing during wet periods, and use of lime and fertilizer are the main pasture management practices.

The soil is suited to trees, and potential productivity is moderately high. The soil is suited to a variety of trees, mainly yellow-poplar, upland oaks, sweetgum, beech, ash, and red maple. Seasonal wetness limits the use of timber equipment several months of the year.

The perched water table, the permeability, and the depth to bedrock limit the soil as a site for septic systems, dwellings with basements, and local roads and streets.

Capability subclass: IIw.

Ma—Manahawkin muck. This soil is nearly level and very poorly drained. It is on flood plains adjacent to large streams and rivers in East Brunswick, Monroe, Old Bridge, South Brunswick, Edison, Plainsboro, Woodbridge, and Cranbury Townships. The areas mostly are long and narrow and range from 5 to 300 acres. Some large areas are oval.

Typically, the surface layer is black muck 12 inches thick. The subsurface layer is dark reddish brown muck about 18 inches thick. The substratum extends to a depth of 60 inches or more. It is very dark grayish brown loamy sand to a depth of 34 inches and gray sand at a depth of more than 34 inches.

Included with this soil in mapping are small areas where the depth to mineral soil is more than 51 inches, small areas of soils that contain more fiber or less fiber than this Manahawkin soil, and small areas of Atsion and Mullica soils. Together, they make up as much as 25 percent of the unit, and they generally are managed the same as this Manahawkin soil. Also included are small areas of Humaquepts, frequently flooded, that make up as much as 10 percent of the unit and that are mainly near the edges of the unit.

The permeability of this Manahawkin soil is moderately slow to moderately rapid in the subsoil and moderately rapid in the substratum. Dry areas of this soil absorb water very slowly. Available water capacity is high. A seasonal high water table is at the surface from Novemeber to June, and some areas have water ponded on the surface. During the summer, the water table is generally at a depth of 1 to 2 feet but is as deep as 3 feet in places during extended dry periods. This soil is subject to frequent flooding. Organic matter content of the soil is high, and natural fertility is low. Unless the soil has been limed, the surface layer is extremely acid and the subsurface layer and substratum are strongly acid to very strongly acid. Runoff is very slow. The soil is easily worked when drained, and tilth is good, but the soil subsides when drained.

This soil is poorly suited to cranberries and blueberries, and wetness limits the soil for most other types of crops. The soil needs protection of flooding, and some areas need drainage.

The soil is suited to trees, and the potential productivity is moderate. Most of the acreage of the soil is used for woodland wildlife habitat. Nearly pure stands of Atlantic white-cedar are dominant, but stands of red maple, sweetgum, blackgum, and pitch pine are common in some places where Atlantic white-cedar has been harvested. The seasonal high water table, low strength for access roads, and flooding limit harvesting of the trees during winter and spring.

This soil is limited for most urban uses by flooding, the seasonal high water table, and subsidence of the surface layer and subsurface layer.

Capability subclass: VIIw.

MeA—Matapeake silt loam, 0 to 2 percent slopes. This soil is nearly level and well drained. It is on broad, flat terraces principally in South Brunswick and Monroe Townships. Slopes are smooth and are about 200 to 500 feet long. The areas range from about 10 to 400 acres.

Typically, the surface layer is dark brown and yellowish brown silt loam about 13 inches thick. The upper part of the subsoil is strong brown silt loam about 8 inches thick. The lower part of the subsoil is yellowish brown loam 10 inches thick. The substratum is strong brown gravelly sandy loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of soils with a surface layer of loam or sandy loam, soils that have a thicker surface layer and subsoil than this Matapeake soil, and soils with small amounts of gravel or cobbles in the surface layer. Together, they make up as much as 25 percent of the unit, and they generally are managed the same as this Matapeake soil. Also included are small areas of Mattapex and Woodstown soils that are limited by wetness. They make up as much as 10 percent of the unit. The Mattapex and Woodstown soils are mainly in small enclosed depressions or drainageways throughout the unit, and the other inclusions are throughout the unit.

The permeability in this Matapeake soil is moderate to moderately slow. Available water capacity is high. Runoff is medium, and the erosion hazard is slight. Tilth is fair, and the soil is moderate in organic matter content. The root zone extends to a depth of about 31 inches. Unless limed, the surface layer and subsoil are very strongly acid.

This soil is well suited to cultivated crops, hay, and pasture. Most of the acreage is used for crops. The hazard of erosion and the need to maintain organic matter content are major management concerns. Incorporating crop residues into the surface layer helps maintain organic matter content. The use of lime and fertilizer offsets acidity and improves fertility of the soil. Conservation tillage and the use of cover crops and grasses and legumes in the cropping system help to reduce runoff and control erosion.

Establishing and maintaining a mixture of grasses and legumes and prevention of overgrazing are major pasture management concerns. The use of proper stocking rates, rotation and deferred grazing, and the use of lime and fertilizer are the main pasture management practices.

This soil is well suited to trees, especially pines and hardwoods, but nearly all of the soil has been cleared for farming. Potential productivity for trees is moderately high. The soil is managed mostly for hardwoods. Upland oaks are the common trees.

This soil has few limitations for most nonfarm uses. The permeability limits the soil as a site for septic tank absorption fields and most recreation uses.

Capability class: I.

MeB—Matapeake silt loam, 2 to 5 percent slopes. This soil is gently sloping and well drained. It is on broad terraces principally in South Brunswick and Monroe Townships. Slopes are smooth. The areas range from about 10 to 400 acres.

Typically, the surface layer is dark brown and yellowish brown silt loam about 13 inches thick. The upper part of the subsoil is strong brown silt loam about 8 inches thick. The lower part of the subsoil is yellowish brown loam 10 inches thick. The substratum is strong brown gravelly sandy loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of soils with a surface layer of loam or sandy loam, soils that have a thicker surface layer and subsoil than this Matapeake soil, and soils with small amounts of gravel or cobbles in the surface layer. Together, they make up as much as 25 percent of the unit, and they generally are managed the same as this Matapeake soil. Also included are small areas of Mattapex and Woodstown soils that are limited by wetness. They make up as much as 10 percent of the unit. The Mattapex and Woodstown soils are mainly in small enclosed depressions or drainageways throughout the unit, and the other inclusions are throughout the unit.

The permeability in this Matapeake soil is moderate to moderately slow. Available water capacity is high. Runoff is medium, and the erosion hazard is slight. Tilth is fair. This soil is moderate in organic matter content. Unless limed, the surface layer and the subsoil commonly are very strongly acid.

This soil is well suited to farming, and most of the acreage is farmed. The hazard of erosion and the need to maintain organic matter content are major management concerns. Incorporating crop residue into the surface layer helps maintain organic matter content. The use of lime and fertilizer offsets acidity and improves fertility of the soil. If this soil is cultivated, conservation tillage, use of cover crops, contour farming, and use of grasses and legumes in the cropping system help to reduce runoff and control erosion.

Establishing and maintaining a mixture of grasses and legumes and prevention of overgrazing are major pasture management concerns. The use of proper stocking rates, rotation and deferred grazing, and the use of lime and fertilizer are the main pasture management practices. If the pasture is overgrazed, runoff and erosion increase.

This soil is suited to trees, and a small acreage is wooded. Potential productivity is moderately high. Upland oaks are the common trees.

This soil has few limitations for most nonfarm uses. The permeability limits the soil as a site for septic tank absorption fields and most recreation uses.

Capability subclass: IIe.

MgA—Mattapex silt loam, 0 to 2 percent slopes. This soil is nearly level and moderately well drained. It is on upland flats, in slight depressions, and along drainageways, principally in South Brunswick, North Brunswick, and Monroe Townships. Slopes are smooth. They commonly are long or irregular. The areas range from about 4 to 100 acres.

Typically, the surface layer is dark grayish brown silt loam about 10 inches thick. The subsoil is 30 inches thick. It is yellowish brown silt loam in the upper part and yellowish brown silty clay loam in the lower part. The substratum is yellowish brown fine sandy loam to a depth of 60 inches or more.

Included with this soil in mapping throughout the unit are small areas of Woodstown loam, soils that have a thicker surface layer than this Mattapex soil, Matapeake and Sassafras soils, soils that are more olive colored and soils with small amounts of gravel. Together, they make up as much as 25 percent of the unit, and they generally are managed the same as this Mattapex soil.

The permeability of this Mattapex soil is moderate to moderately slow. Available water capacity is high. Runoff is slow, and the erosion hazard is slight. Tilth is fair, and the soil is moderate in organic matter content. The root zone extends to a depth of 60 inches or more. In unlimed areas the surface layer and the subsoil commonly are very strongly acid. The seasonal water table is at a depth of 1.5 to 2.5 feet from January to April.

This soil is well suited to cultivated crops and to hay and pasture, and most of the acreage is farmed. Alfalfa is short lived because of seasonal wetness. Water ponds for short periods in depressions, and such areas are usually difficult to drain. Tilth can be maintained or improved by incorporating organic matter into the soil and by plowing when the soil is at the proper moisture content. The use of lime and fertilizer reduces acidity and increases fertility. Conservation tillage and the use of cover crops and grasses and legumes in the cropping system help to maintain tilth and increase organic matter content and fertility.

Establishing and maintaining a mixture of grasses and legumes and preventing overgrazing are major pasture management concerns. Controlled, rotation, and deferred grazing, the use of lime and fertilizer, and artificial drainage are the main pasture management practices.

This soil is suited to trees, but little acreage is wooded. Potential productivity is moderately high. The soil is managed mostly for hardwoods. Yellow-poplar, red oak, scarlet oak, white oak, and black oak are the dominant trees.

The permeability and the seasonal high water table limit this soil for most nonfarm uses, especially as a site for septic tank filter fields, dwelling foundations, and local roads and streets.

Capability subclass: IIw.

MgB—Mattapex silt loam, 2 to 5 percent slopes. This soil is gently sloping and moderately well drained. It is on undulating uplands, in depressions, and along drainageways, principally in South Brunswick, North Brunswick, and Monroe Townships. Slopes are smooth or convex. The areas commonly are long or irregularly shaped. They range from about 4 to 100 acres.

Typically, the surface layer is dark grayish brown silt loam about 10 inches thick. The subsoil is 30 inches thick. It is yellowish brown silt loam in the upper part and yellowish brown silty clay loam in the lower part. The substratum is yellowish brown fine sandy loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Woodstown loam, soils that have a thicker surface layer than this Mattapex soil, Matapeake and Sassafras soils, and soils with small amounts of gravel. Together, they make up as much as 25 percent of the unit, and they generally are managed the same as this Mattapex soil. They are throughout the unit.

The permeability of this Mattapex soil is moderate to moderately slow. Available water capacity is high. Runoff is slow, and the erosion hazard is moderate. Tilth is fair, and the soil is moderate in organic matter content. The root zone extends to a depth of 60 inches or more. In unlimed areas the surface layer and the subsoil commonly are very strongly acid. The seasonal water table is at a depth of 1.5 to 2.5 feet from Janurary to April.

This soil is well suited to cultivated crops and to hay and pasture, and most of the acreage is farmed. The commonly grown crops are corn, soybeans, hay, and vegetables. Alfalfa is short lived because of seasonal wetness. Water ponds for short periods in depressions, and such areas are usually difficult to drain. If the soil is cultivated, conservation tillage, contour farming, and the use of cover crops and grasses and legumes in the cropping system are practices that help reduce runoff and control erosion. Diversion terraces and subsurface drains are needed on some long slopes.

Establishing and maintaining a mixture of grasses and legumes and preventing overgrazing are major pasture management concerns. Controlled, rotation, and deferred grazing, the use of lime and fertilizer, and artificial drainage are the main pasture management practices.

This soil is suited to trees, but little acreage is wooded. Potential productivity is moderately high. The soil is managed mostly for hardwoods. Yellow-poplar, red oak, scarlet oak, white oak, and black oak are the dominant trees.

The permeability and the seasonal high water table limit this soil for most nonfarm uses, especially as a site for septic tank filter fields, dwelling foundations, and local roads and streets.

Capability subclass: IIw.

MoA—Mount Lucas silt loam, 0 to 2 percent slopes. This soil is nearly level and moderately well drained. It is on narrow, convex ridgetops and on narrow, convex side slopes, in South Brunswick Township. Slopes are smooth and commonly complex. The areas of this soil commonly are oblong or irregular in shape. They range from about 5 to 80 acres.

Typically, the surface layer is dark grayish brown silt loam about 6 inches thick. The subsoil is yellowish brown and strong brown silty clay loam about 24 inches thick and is 10 to 15 percent diabase cobbles and stones. The substratum extends to a depth of 60 inches or more. It is strong brown gravelly clay loam and is 40 to 50 percent diabase cobbles and stones.

Included with this soil in mapping are small areas of soils with fewer rock fragments than this Mount Lucas soil, areas with slopes of more than 2 percent, and areas of Chalfont soils. Together, they make up as much as 30 percent of the unit, and they generally are managed the same as this Mount Lucas soil. Also included are small areas of soils with more rock fragments than this Mount Lucas soil and areas of Watchung or Elkton soils. They make up as much as 10 percent of the unit and are throughout the unit. The Watchung and Elkton soils are commonly in slight depressions and draws.

The permeability of this Mount Lucas soil is moderate to slow. Available water capacity is high. Runoff is slow. Tilth is fair, and the soil is high in natural fertility and moderate in organic matter content. The subsoil has a moderate shrink-swell potential. The root zone extends to a depth of 60 inches or more. Unless limed, the surface layer and subsoil commonly are medium acid. Bedrock is commonly at a depth of 6 to 10 feet. The seasonal high water table is at a depth of 6 inches to 3 feet.

This soil is moderately well suited to cultivated crops and to pasture and hay, but alfalfa is short lived because of seasonal wetness. The need for drainage and the need to increase organic matter are the main management concerns. Using crop residue maintains or increases organic matter content. The use of lime and fertilizer reduces acidity and improves fertility of the soil. If the soil is cultivated, conservation tillage and the use of cover crops and grasses and legumes in the cropping system are practices that help increase organic water content and maintain tilth.

Establishing and maintaining a mixture of grasses and legumes and preventing overgrazing are major pasture management concerns. Controlled, rotation, and deferred grazing, the use of lime and fertilizer, and artificial drainage are the main pasture management practices.

The soil is suited to trees, and most of the acreage is wooded. Potential productivity is high. This soil is managed mostly for hardwoods. It is suited to a variety of trees, mainly hickory, oaks, gum, ash, yellow-poplar,

and beech. The use of timber equipment is limited by wetness during winter and spring.

Low strength, the permeability, the seasonal wetness, and the shrink-swell potential limit the soil for many urban uses. The seasonal wetness limits the soil as a site for septic tank filter fields and for dwellings with basements. The low strength limits the soil as a site for local roads and streets.

Capability subclass: IIw.

MoB—Mount Lucas silt loam, 2 to 5 percent slopes. This soil is gently sloping and moderately well drained. It is on narrow, convex ridgetops and on narrow, convex side slopes on undulating uplands, all in South Brunswick Township. Slopes are smooth, commonly complex, and about 80 to 300 feet long. The areas of this soil commonly are oblong or irregular in shape. They range from about 5 to 80 acres.

Typically, the surface layer is dark grayish brown silt loam about 6 inches thick. The subsoil is yellowish brown and strong brown silty clay loam about 24 inches thick and is 10 to 15 percent diabase cobbles and stones. The substratum extends to a depth of 60 inches or more. It is strong brown gravelly clay loam and is 40 to 50 percent diabase cobbles and stones.

Included with this soil in mapping are small areas of soils with fewer rock fragments than this Mount Lucas soil, areas with slopes of more than 2 percent, and areas of Chalfont soils. Together, they make up as much as 30 percent of the unit, and they generally are managed the same as this Mount Lucas soil. Also included are small areas of soils with more rock fragments than this Mount Lucas soil and areas of Watchung or Elkton soils. They make up as much as 10 percent of the unit and are throughout the unit. The Watchung and Elkton soils are commonly in slight depressions and draws.

The permeability of this Mount Lucas soil is moderate to slow. Available water capacity is high. Runoff is medium. Tilth is fair, and the soil is high in natural fertility and moderate in organic matter content. The subsoil has a moderate shrink-swell potential. The root zone extends to a depth of 60 inches or more. Unless limed, the surface layer and subsoil commonly are medium acid. Bedrock is commonly at a depth of 6 to 10 feet. The seasonal high water table is at a depth of 6 inches to 3 feet.

This soil is moderately well suited to cultivated crops and to pasture and hay. Alfalfa is short lived because of seasonal wetness. A hazard of erosion, the need for drainage, and the need to increase organic matter content are major management concerns. Using crop residue maintains or increases organic matter content. The use of lime and fertilizer offsets acidity and increases fertility. If the soil is cultivated, conservation tillage and the use of cover crops and grasses and legumes in the cropping system are practices that reduce runoff and control erosion.

Establishing and maintaining a mixture of grasses and legumes and the prevention of overgrazing are major pasture management concerns. The use of proper stocking rates, rotation and deferred grazing, and the use of lime and fertilizer are the main pasture management practices. If the pasture is overgrazed, runoff and erosion increase. Grazing during periods of seasonal wetness cuts and compacts the surface layer and increases erosion.

The soil is suited to trees, and most of the acreage is wooded. Potential productivity is high. This soil is managed mostly for hardwoods. The soil is suited to a variety of trees, mainly hickory, oaks, gum, ash, yellow-poplar, and beech. The use of timber equipment is limited by seasonal wetness in winter and spring.

Low strength, the permeability, the seasonal wetness, and the shrink-swell potential limit the soil for many urban uses. The seasonal wetness limits the soil as a site for septic tank filter fields and dwellings with basements. The low strength limits the soil as a site for local roads and streets.

Capability subclass: IIe.

MsB—Mount Lucas very stony silt loam, 0 to 5 percent slopes. This soil is nearly level to gently sloping and is moderately well drained. It is on narrow, convex side slopes adjacent to streams and on undulating uplands, all in South Brunswick Township. Slopes are smooth and commonly complex. The areas of this soil commonly are oblong or irregular in shape. They range from about 5 to 80 acres. Stones cover about 3 to 15 percent of the surface.

Typically, the surface layer is dark grayish brown silt loam about 6 inches thick. The subsoil is yellowish brown and strong brown silty clay loam about 24 inches thick and is 10 to 15 percent gravel, cobbles, and stones. The substratum extends to a depth of 60 inches or more. It is strong brown gravelly clay loam and is 15 to 40 percent gravel, cobbles, and stones.

Included with this soil in mapping are small areas of soils that have fewer rock fragments than this Mount Lucas soil, soils with slopes of more than 5 percent, and Chalfont soils. Together, they make up as much as 35 percent of the unit, and they generally are managed the same as this Mount Lucas soil. Also included are small areas of Watchung and Elkton soils that make up as much as 10 percent of the unit. The Woodstown, Chalfont, Watchung, and Elkton soils are commonly on toe slopes. The other inclusions are throughout the unit.

The permeability of this Mount Lucas soil is moderate to slow. Available water capacity is high. Runoff is medium. Tilth is fair, and the soil is high in natural fertility and moderate in organic matter content. The subsoil has a moderate shrink-swell potential. The root zone extends to a depth of 60 inches or more. Unless limed, the surface layer and subsoil commonly are medium acid. Bedrock is commonly at a depth of 6 to 10 feet. The

seasonal high water table is at a depth of 6 inches to 3 feet.

This soil is too stony for cultivated crops or pasture (fig. 5). The stones are too large and too numerous to be removed.

This soil is suited to trees, most of the acreage is wooded. Potential productivity is high, but the rooting depth is restricted by the seasonal high water. The soil is suited to a variety of trees, mainly oaks, hickory, gum, ash, yellow-poplar, and beech. The stones on the surface and wetness during the winter and spring limit the use of timber equipment.

Low strength, the permeability, the seasonal wetness, and the shrink-swell potential limit the soil for many urban uses. The seasonal wetness limits the soil as a site for septic tank filter fields and dwellings with basements. The low strength limits the soil as a site for local roads and streets.

Capability subclass: VIs.

Mu—Mullica sandy loam. This soil is nearly level and very poorly drained. It is in low-lying upland flats, in slight depressions, and along drainageways, all mainly in South Brunswick Townships. The areas are irregular in shape and range from 5 to 500 acres.

Typically, the surface is covered with black muck about 4 inches thick. The surface layer is very dark gray sandy loam about 7 inches thick. The subsoil is mottled and is about 21 inches thick. It is light brownish gray sandy loam in the upper part and light brownish gray

Figure 5.—Stones and boulders on Mount Lucas very stony silt loam, 0 to 5 percent slopes, make cultivation for crops impractical.

gravelly sandy loam in the lower part. The substratum extends to a depth of 60 inches or more. It is greenish gray sandy loam, sandy clay loam, and loamy sand.

Included with this soil in mapping are small areas of soils with a surface layer of silt loam, Fallsington soils, and slightly olive-colored soils. They make up as much as 15 percent of the unit and generally are managed the same as this Mullica soil. Also included are small areas of Woodstown soils and Humaquepts, frequently flooded. They make up as much as 10 percent of the unit and are on slight knolls throughout the unit. The other inclusions are throughout the unit, mainly in drainageways and slight depressions.

The permeability of this Mullica soil is moderate in the subsoil and moderately rapid in the substratum. If the soil is drained, available water capacity is moderate, but water is available to plants from the water table. The seasonal high water table is at the surface from December to May. Some areas have water ponded on the surface. In summer, the water table generally is at a depth of 2 to 3 feet but is as deep as 5 feet in places during extended dry periods. Areas adjacent to perennial streams are subject to rare flooding. The root zone extends to a depth of 60 inches but is generally restricted by the seasonal high water. Organic matter content of the soil is high, and natural fertility is medium. Unless the soil has been limed, the surface layer is extremely acid and the subsoil and substratum are very strongly acid. Runoff is very slow. Tilth is good, and the soil is easily worked when drained.

Most of the acreage of this soil is used for woodland. A few areas are in pasture, and some are cultivated.

If drainage and land smoothing are used, this soil is suited to cultivated crops, mainly blueberries and some late-season vegetables. Wetness is a severe hazard and is the major management concern. Providing drainage, primarily by tile or open ditch, and using water-tolerant plant species are the main management practices. Drainage outlets are not available in some areas.

This soil is suited to pasture if drainage, proper seeding, proper stocking, and rotation grazing are used.

The soil is suited to trees, and the potential productivity is moderate. Blackgum, sweetgum, red maple, pin oak, willow oak, swamp white oak, and black birch are the common species. The seasonal high water table limits harvesting during winter and spring.

The seasonal high water table limits the soil for most urban uses. It especially limits the soil as a site for shallow excavations, septic tank absorption fields, local roads and streets, and lawns and landscaping. The sides of excavations in this soil collapse when saturated.

Capability subclass: IIIw.

NaA—Nixon loam, 0 to 2 percent slopes. This soil is nearly level and well drained. It is on high terraces and divides in South Brunswick, Edison, Plainsboro, North Brunswick, and New Brunswick Townships. Slopes are dominantly convex and range in length mainly from 100 to 300 feet. The areas are irregular in shape and range from 5 to 200 acres.

Typically, the surface layer is brown loam about 8 inches thick. The subsurface layer is strong brown loam 3 inches thick. The upper part of the subsoil is yellowish red loam 19 inches thick. The lower part is yellowish red sandy loam 10 inches thick. The substratum extends to a depth of 60 inches or more. It is strong brown stratified sandy loam.

Included with this soil in mapping are small areas of Sassafras loam and soils with a surface layer of silt loam or sandy loam or a cobbly surface layer. They make up as much as 30 percent of the unit and generally are managed the same as this Nixon soil. Also included are Woodstown, Nixon Variant, and Lansdowne soils and soils with red shale bedrock at a depth of less than 60 inches. They make up as much as 10 percent of the unit. The Nixon Variant and Lansdowne soils are in slight depressions. The areas where the red shale bedrock is at a depth of less than 60 inches are on slight knolls between Princeton and Metuchen. The soils with a surface layer of silt loam and the Sassafras soils are throughout the unit.

The permeability of this Nixon soil is moderate in the subsoil and moderately rapid in the substratum. Available water capacity is moderate. Natural fertility is medium, and the organic matter content is moderate. The water table is rarely perched in the subsoil for more than a few hours. The root zone extends to a depth of 60 inches or more. In unlimed areas the surface layer and the subsoil are very strongly acid. Tilth is good, and the soil is easily worked. Runoff is slow, and the erosion hazard is slight.

This soil is well suited to such cultivated crops as corn, soybeans, hay, fruit, and nursery crops. Much of the acreage is used for crops. The soil can be worked fairly early. Maintaining the organic matter content and tilth and controlling erosion are the major management concerns. Most high-value crops respond well to irrigation. Conservation tillage, the use of crop residue on or in the surface layer, and the use of cover crops and grasses and legumes in the cropping system help to increase organic matter content and maintain tilth. The use of lime and fertilizer offsets the acidity and increases fertility of the soil. Tilling within the proper range of moisture content helps to reduce soil compaction and clodding.

Establishing and maintaining a mixture of grasses and legumes and the prevention of overgrazing are the major pasture management concerns. The use of proper stocking rates, rotation and deferred grazing, and the use of lime and fertilizer are the main pasture management practices. If the pasture is overgrazed, some of the desirable grasses and legumes die out. Grazing during periods of wetness often cuts and compacts the surface layer.

This soil is suited to trees, and potential productivity is high, but only a small acreage is wooded. The soil is suited to a variety of trees. Yellow-poplar, red oak, scarlet oak, white oak, black oak, ash, black birch, beech, and hickories are the common important trees. Machine planting is practical on large areas.

This soil is generally suitable for most urban uses.

Capability class: I.

NaB—Nixon loam, 2 to 5 percent slopes. This soil is gently sloping and well drained. It is on high terraces and divides in East Brunswick, South Brunswick, Edison, Plainsboro, North Brunswick, and New Brunswick Townships. Slopes range in length mainly from 100 to 300 feet. The areas are irregular in shape and range from 5 to 200 acres.

Typically, the surface layer is brown loam about 8 inches thick. The subsurface is strong brown loam 3 inches thick. The upper part of the subsoil is yellowish red loam 19 inches thick. The lower part is yellowish red sandy loam 10 inches thick. The substratum extends to a depth of 60 inches or more. It is strong brown stratified sandy loam.

Included with this soil in mapping are small areas of Sassafras loam and soils with a surface layer of silt loam or sandy loam or a cobbly surface layer. They make up as much as 30 percent of the unit and generally are managed the same as this Nixon soil. Also included are Woodstown, Nixon Variant, and Lansdowne soils and soils with red shale bedrock at a depth of less than 60 inches. They make up as much as 10 percent of the unit. The Nixon Variant and Lansdowne soils are in slight depressions. The areas where the red shale bedrock is at a depth of less than 60 inches are on slight knolls between Princeton and Metuchen. The soils with a surface layer of silt loam and the Sassafras soils are throughout the unit.

The permeability of this Nixon soil is moderate in the subsoil and moderately rapid in the substratum. Available water capacity is moderate. Natural fertility is medium, and the organic matter content is moderate. The water table is rarely perched in the subsoil for more than a few hours. The root zone extends to a depth of 60 inches or more. In unlimed areas the surface layer and the subsoil are very strongly acid. Tilth is good, and the soil is easily worked. Runoff is slow, and the erosion hazard is slight.

This soil is well suited to such cultivated crops as corn, soybeans, hay, fruit, and nursery crops. Much of the acreage is used for crops. The soil can be worked fairly early. Maintaining the organic matter content and tilth and controlling erosion are the major management concerns. Most high-value crops respond well to irrigation. Conservation tillage, the use of crop residue on or in the soil, and the use of cover crops and grasses and legumes in the cropping system help to increase organic matter content and maintain tilth. The use of lime and fertilizer offsets the acidity and increases fertility of the soil. Tilling within the proper range of moisture content helps to reduce soil compaction and clodding.

Establishing and maintaining a mixture of grasses and legumes and the prevention of overgrazing are major pasture management concerns. The use of proper stocking rates, rotation and deferred grazing, and the use of lime and fertilizer are the main pasture management practices. If the pasture is overgrazed, runoff and erosion increase.

This soil is suited to trees, and potential productivity is high, but only a small acreage is wooded. The soil is suited to a variety of trees. Yellow-poplar, red oak, scarlet oak, white oak, black oak, ash, black birch, beech, and hickories are the common important trees. Machine planting is practical on large areas.

This soil is generally suitable for most urban uses.

Capability subclass: IIe.

NCB—Nixon-Urban land complex, 0 to 5 percent slopes. This unit consists mainly of nearly level to gently sloping, well drained Nixon soils and areas that are used for urban development. The unit is on high terraces and divides principally in New Brunswick, North Brunswick, and Edison Townships. Slopes are smooth and range in length from 100 to 900 feet. The areas are irregular in shape and range from 20 to 400 acres. The soils and urbanized areas are in such an intricate pattern that it was not practical to map them separately.

About 40 percent of this unit is Nixon soils. Typically, they have a surface layer of brown loam about 8 inches thick. The subsurface layer is strong brown loam 3 inches thick. The upper part of the subsoil is yellowish red loam 19 inches thick. The lower part is yellowish red sandy loam 10 inches thick. The substratum extends to a depth of 60 inches or more. It is strong brown stratified sandy loam.

About 40 percent of this unit is areas covered mainly by concrete, asphalt, buildings, or other impervious surfaces.

Included with this unit in mapping are small areas of Sassafras loam; soils with a surface layer of silt loam or sandy loam or a cobbly surface layer; areas of soils that have been covered by more than 20 inches of fill material, commonly from adjacent areas of Nixon soils that have been cut or graded; and areas where most or all of the original soil has been removed. Together, they make up as much as 15 percent of the unit, and they generally are managed the same as this Nixon soil. Also included are areas of Woodstown, Nixon Variant, and Lansdowne soils and soils with red shale bedrock at a depth of less than 60 inches. They make up as much as 5 percent of the unit. The Woodstown, Nixon Variant, and Lansdowne soils are in slight depressions. The cobbly spots and spots with the red shale bedrock are on slight knolls between Princeton to Metuchen. The

soils with a surface layer of silt loam and the Sassafras soils are throughout the unit.

The permeability in these Nixon soils is moderate in the subsoil and moderately rapid in the substratum. Runoff is slow to medium, and the hazard of erosion is moderate. Available water capacity is moderate in undisturbed areas, and it is low to very low in areas dominated by cuts and fills. Most unlimed areas are very strongly acid.

The undisturbed areas of soils in this unit are mainly in yards and around and between structures. Those areas range from 500 to 7,000 square feet. The soils and fill in those areas are generally suitable for lawns, shade trees, ornamental trees, shrubs and vines, and vegetable gardens. The areas that have been disturbed generally are sandy and droughty and have poor suitability for plants, trees, and grasses.

Capability subclass: VIIs.

NfA—Nixon Variant loam, 0 to 2 percent slopes. This soil is nearly level and moderately well drained. It is on high terraces and side slopes in North Brunswick, Edison, Plainsboro, South Brunswick, and New Brunswick Townships. Slopes are smooth or convex and range in length mainly from 50 to 300 feet. The areas are irregular in shape and range from 5 to 100 acres.

Typically, the surface layer is very dark grayish brown loam about 8 inches thick. The subsurface layer is dark brown and strong brown loam 8 inches thick. The subsoil is yellowish red and is 22 inches thick. It is loam in the upper part and sandy loam in the lower part. The substratum is very pale brown sandy loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of soils with a surface layer of silt loam; Nixon, Woodstown, and Sassafras soils; and soils with a sandy surface layer or a surface layer that has a small amount of cobbles in it. Together, they make up as much as 30 percent of the unit, and they generally are managed the same as this Nixon Variant soil. Also included are small areas where red shale bedrock is at a depth of less than 60 inches and areas of Fallsington Variant soils. They make up as much as 20 percent of the unit. The soils with a surface layer of sandy loam, those with cobbles in the surface layer, and those with red shale bedrock are on slight knolls. The soils with a surface layer of silt loam are throughout the unit. The Fallsington Variant soils are in slight depressions and drainageways.

The permeability of this Nixon Variant soil is moderate in the subsoil and moderately rapid in the substratum. Available water capacity is high. A seasonal high water table is at a depth of 1 to 4 feet from late winter to early spring. This soil is subject to frost heaving. Water is perched in the subsoil for short periods following heavy rains. Runoff is slow. The root zone extends to a depth of 60 inches or more. Natural fertility is medium, and organic matter content is moderate. In unlimed areas the surface layer and subsoil are strongly acid. Tilth is fair, and the soil dries slowly in the spring.

Most of the acreage of this soil is farmed. A few acres are in pasture, and a few are in woodland.

This soil is well suited to such cultivated crops as corn, soybeans, tomatoes, cabbage, and other vegetables and to hay and pasture. Alfalfa is short lived because of seasonal wetness. Tilth can be maintained or improved by incorporating crop residue into the soil or by plowing when the soil has the proper moisture content. Conservation tillage and the use of cover crops and grasses and legumes in the cropping system are practices that help to reduce runoff and maintain tilth. The periodic use of lime and fertilizer offsets acidity and increases fertility.

This soil is well suited to pasture, especially tall grass-clover mixtures. Wetness restricts grazing during winter and early spring. Pasture plants on this soil respond well to applications of fertilizer.

The soil is well suited to a variety of trees, mainly yellow-poplar, upland oaks, sweet gum, beech, and red maple. Potential productivity is high.

The seasonal high water table and the permeability limit this soil for nonfarm use. They especially limit the soil as a site for shallow excavations, septic tank absorption fields, and dwellings with basements.

Capability subclass: IIw.

NfB—Nixon Variant loam, 2 to 5 percent slopes. This soil is gently sloping and moderately well drained. It is on high terraces and side slopes in North Brunswick, Edison, Plainsboro, South Brunswick, and New Brunswick Townships. Slopes are smooth or convex and range in length mainly from 50 to 300 feet. The areas are irregular in shape and range from 5 to 100 acres.

Typically, the surface layer is very dark grayish brown loam about 8 inches thick. The subsurface layer is dark brown and strong brown loam 8 inches thick. The subsoil is yellowish red and is 22 inches thick. It is loam in the upper part and sandy loam in the lower part. The substratum is very pale brown sandy loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of soils with a surface layer of silt loam; Nixon, Woodstown, and Sassafras soils; and soils with a sandy surface layer or a surface layer that has a small amount of cobbles in it. Together, they make up as much as 30 percent of the unit, and they generally are managed the same as this Nixon Variant soil. Also included are small areas where red shale bedrock is at a depth of less than 60 inches and areas of Fallsington Variant soils. They make up as much as 20 percent of the unit. The soils with a surface layer of sandy loam, those with cobbles in the surface layer, and those with red shale bedrock are on slight knolls. The soils with a surface layer of silt loam are throughout the unit. The Fallsington Variant soils are in slight depressions and drainageways.

The permeability of this Nixon Variant soil is moderate in the subsoil and moderately rapid in the substratum. Available water capacity is high. A seasonal high water table is at a depth of 1 to 4 feet from late winter to early spring. This soil is subject to frost heaving. Water is perched in the subsoil for short periods following heavy rains. Runoff is slow. The root zone extends to a depth of 60 inches or more. Natural fertility is medium, and organic matter content is moderate. In unlimed areas the surface layer and subsoil are strongly acid. Tilth is fair, and the soil dries slowly in the spring.

Most of the acreage of this soil is farmed. A few acres are in pasture, and a few are in woodland.

This soil is well suited to such cultivated crops as corn, soybeans, tomatoes, cabbage, and other vegetables and to hay and pasture. Alfalfa is short lived because of seasonal wetness. Tilth can be maintained or improved by incorporating crop residue into the soil or by plowing when the soil has the proper moisture content. Conservation tillage and the use of cover crops and grasses and legumes in the cropping system are practices that help to reduce runoff and maintain tilth. The periodic use of lime and fertilizer offsets acidity and increases fertility.

This soil is well suited to pasture, especially tall grass-clover mixtures. Wetness restricts grazing during winter and early spring. Pasture plants on this soil respond well to applications of fertilizer.

The soil is well suited to a variety of trees, mainly yellow-poplar, upland oaks, sweet gum, beech, and red maple. Potential productivity is high.

The seasonal high water table and the permeability limit this soil for nonfarm use. They especially limit the soil as a site for shallow excavations, septic tank absorption fields, and dwellings with basements.

Capability subclass: IIw.

NGA—Nixon Variant-Urban land complex, 0 to 5 percent slopes. This unit consists mainly of nearly level to gently sloping, moderately well drained Nixon Variant soils and areas that are used for urban development. The unit is on high terraces and divides principally in Edison, North Brunswick, and New Brunswick Townships. Slopes are smooth and range in length from 100 to 900 feet. The areas are irregular in shape and range from 20 to 200 acres. The soils and urbanized areas are in such an intricate pattern that it was not practical to map them separately.

About 40 percent of this unit is areas of Nixon Variant soils. Typically, they have a surface layer of very dark grayish brown loam about 8 inches thick. The subsurface layer is dark brown and strong brown loam 8 inches thick. The subsoil is yellowish red and is 22 inches thick. It is loam in the upper part and sandy loam in the lower part. The substratum is very pale brown loam and sandy loam to a depth of 60 inches or more.

About 40 percent of the unit consists of areas covered by concrete, buildings, or other structures.

Included with this unit in mapping are small areas of soils with a surface layer of silt loam; Nixon, Woodston, and Sassafras soils; soils that have a surface layer of sandy loam or a surface layer that contains a small amount of cobbles; soils that have been covered by more than 20 inches of fill material, commonly from adjacent areas of Nixon Variant soils; and areas where most or all of the original soils has been removed. Together, they make up as much as 15 percent of this unit and generally are managed the same as these Nixon Variant soils. Also included are small areas of soils that have red shale bedrock at a depth of less than 60 inches and small areas of Fallsington Variant soils. They make up as much as 5 percent of the unit. The soils with a surface layer of sandy loam, those with a cobbly surface layer, and those with red shale bedrock are on slight knolls. The soils with a surface layer of silt loam are throughout the unit, and the Fallsington Variant soils are in depressions and drainageways.

The permeability in these Nixon Variant soils is moderate in the subsoil and moderately rapid in the substratum. Runoff is slow, and the hazard of erosion is slight. Available water capacity is high in the undisturbed areas, and it is low in the areas dominated by cuts, fills, and Urban land. Most unlimed areas are very strongly acid.

The undisturbed areas of soils in this unit are mainly in yards and around and between structures. Those areas range from 500 to 7,000 square feet. The soils and fill in those areas are generally suitable for lawns, shade trees, ornamental trees, shrubs and vines, and vegetable gardens. The areas that have been disturbed generally are sandy and droughty and have poor suitability for plants, trees, and grasses.

Capability subclass: not assigned.

Pa—Parsippany silt loam. This soil is nearly level and poorly drained. It is on terraces near streams and in low-lying flats, mainly in Edison, Piscataway, South Brunswick, and Woodbridge Townships. Slopes are smooth or convex. The areas are irregular in shape and range from 5 to 100 acres.

Typically, the surface layer is very dark brown silt loam about 2 inches thick. The subsurface layer is pinkish gray silt loam about 6 inches thick. The subsoil is about 40 inches thick. The upper 16 inches is pinkish gray silty clay loam and silty clay. The middle 12 inches is reddish brown silty clay. The lower 12 inches is reddish brown silty clay loam. The substratum is reddish brown sandy loam to a depth of 60 inches or more.

Included with this soil in mapping are areas of soils similar to this Parsippany soil but that are more gray, more red, contain more gravel, are shallower to the substratum, or have bedrock at a depth of less than 60 inches. They make up as much as 30 percent of the unit

and generally are managed the same as this Parsippany soil. Also included are small areas of frequently flooded Humaquepts and Reaville and Nixon Variant soils. They make up as much as 20 percent of the unit. The Humaquepts are drainageways through the unit. The Reaville and Nixon Variant soils are commonly on slight knolls throughout or near the edges of the unit. The other inclusions are throughout the unit.

The permeability of this Parsippany soil is slow in the subsoil and moderate in the substratum. Available water capacity is high. This soil is subject to severe frost heaving. The subsoil has a moderate shrink-swell potential. Excess water is perched in the subsoil from late fall to late spring. Runoff is slow to ponded, and the erosion hazard is slight. The root zone extends to a depth of 40 inches but is seasonally restricted by wetness at a depth of about 20 inches. During years with normal rainfall, the seasonal high water is nearest the surface from January to March. It generally drops to a depth of 3 feet or more from June to September.

Most of the acreage of this soil is in native vegetation or woodland.

The seasonal high water and a lack of suitable outlets make the soil generally poorly suited to crops. The clayey subsoil is difficult to drain.

Most areas used for pasture require surface drainage, but outlets are difficult to locate in this soil. The soil is too wet for grazing from late fall to late spring. Summer grazing is more practical.

The soil is suited to a variety of trees, mainly pin oak, scarlet oak, white oak, sweetgum, ash, and red maple. Potential productivity is moderate. The use of harvesting equipment is limited by long wet periods.

The seasonal high water table, low strength, and the permeability limit the soil as a site for septic effluent disposal, dwellings with basements, lawns, landscaping, and local roads and streets.

Capability subclass: IVw.

Pb—Parsippany silt loam, frequently flooded. This soil is nearly level and poorly drained. It is adjacent to streams in Piscataway Township. Slopes are smooth or convex. The areas are narrow and long. They are subject to flooding several times each year.

Typically, the surface layer is dark reddish brown silt loam about 4 inches thick. The subsurface layer is reddish brown silty clay loam about 6 inches thick. The subsoil is about 40 inches thick. The upper 10 inches is brown silty clay loam and gray silty clay. The middle 16 inches is gray clay. The lower 14 inches is gray silty clay loam. The substratum is dark reddish brown sandy loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of flooded Parsippany Variant soils with a surface layer of fine sandy loam or strata of coarser texture material and soils that are less than 30 inches deep to coarser textured material. They make up as much as 30 percent of the unit and generally are managed the same as this Parsippany soil. Also included are small areas of Reaville and Dunellen Variant soils that make up as much as 15 percent of the unit.

The permeability of this Parsippany soil is slow in the subsoil and moderate in the substratum. Available water capacity is high. This soil is subject to severe frost heaving. The subsoil has a moderate shrink-swell potential. Excess water is perched in the subsoil from late fall to late spring. Runoff is slow to ponded, and the erosion hazard is slight. The root zone extends to a depth of 40 inches but is seasonally restricted by wetness at a depth of about 20 inches. During years with normal rainfall, the seasonal high water table is nearest the surface from January to March. It generally drops to a depth of 3 feet or more from June to September.

Most of the acreage of this soil is in native vegetation or woodland.

The seasonal high water and a lack of suitable outlets make the soil generally poorly suited to crops. The clayey subsoil is difficult to drain.

Most areas used for pasture require surface drainage, but outlets are difficult to locate in this soil. The soil is too wet for grazing from late fall to late spring. Summer grazing is more practical.

The soil is suited to a variety of trees, mainly pin oak, scarlet oak, white oak, sweetgum, ash, and red maple. Potential productivity is moderate. The use of harvesting equipment is limited by long wet periods.

The seasonal high water table, low strength, and the permeability limit the soil as a site for septic effluent disposal, dwelling with basements, lawns, landscaping, and local roads and streets.

Capability subclass: Vw.

Pc—Parsippany Variant silt loam. This soil is nearly level and very poorly drained. It is on low-lying flats and along drainageways in Edison and South Plainfield Townships. Slopes are smooth and uniform. The areas are irregular in shape and range from 10 to 75 acres.

Typically, the surface layer is black silt loam about 3 inches thick. The subsoil is about 20 inches thick. The upper part is black clay 16 inches thick, and the lower part is gray silty clay loam 7 inches thick. The substratum is brown, dark brown, and dark reddish gray stratified loamy sand, fine sandy loam and sandy loam and extends to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Parsippany, Haledon Variant, and Fallsington Variant soils and soils similar to this Parsippany Variant soil but that contain more gravel, are redder, or are deeper to stratified material and shale bedrock. Together, they make up as much as 25 percent of the unit, and they generally are managed the same as this Parsippany Variant soil. Also included are small areas of frequently flooded Humaquepts and frequently flooded Parsippany soils. They make up as much as 10 percent of the unit.

The permeability of this Parsippany Variant soil is slow. Available water capacity is high. A seasonal high water table is between the surface and a depth of 1 foot from October to May. During years with normal rainfall, the water table starts to rise in October and is nearest the surface in early spring. This soil is subject to severe frost heaving. The subsoil has a moderate shrink-swell potential. Runoff is slow to ponded, and the erosion hazard is slight. The root zone extends to a depth of 40 inches but is seasonally restricted by wetness at a depth of 15 inches.

Most of the acreage of this soil is in native vegetation or woodland.

The seasonal high water and a lack of suitable outlets make the soil generally poorly suited to crops. The clayey subsoil is difficult to drain.

Most areas used for pasture require surface drainage, but outlets are difficult to locate in this soil. The soil is too wet for grazing from late fall to late spring. Summer grazing is more practical.

The soil is suited to a variety of trees, mainly pin oak, scarlet oak, white oak, sweetgum, ash, and red maple. Potential productivity is moderate. The use of harvesting equipment is limited by long wet periods.

The seasonal high water table, low strength, and the permeability limit the soil as a site for septic effluent disposal, dwellings with basements, lawns, landscaping, and local roads and streets.

Capability subclass: IVw.

PeA—Pemberton loamy sand, 0 to 3 percent slopes. This soil is nearly level to gently sloping. It is on low divides. The soil is moderately well drained or somewhat poorly drained, but in most areas it is moderately well drained. The areas are irregular in shape and range mainly from 5 to 75 acres.

Typically, the surface layer is dark yellowish brown loamy sand about 8 inches thick. The subsurface layer is yellowish brown loamy sand 20 inches thick. The subsoil is mottled, yellowish brown sandy loam 17 inches thick. The substratum extends to a depth of 60 inches or more. It is yellowish brown sand with olive gray and strong brown mottles.

Included with this soil in mapping are small areas of soils with a surface layer of sandy loam and Tinton soils. Also included are small areas of Holmdel and Shrewsbury soils. Included soils make up about 25 percent of this map unit.

The permeability of this Pemberton soil is moderate in the subsoil and moderately rapid in the substratum. Available water capacity is moderate, but plants obtain water early and late in the season from the water table. Organic matter content of the soil is low, and natural fertility is medium. Unless limed, this soil is extremely acid in the surface layer and very strongly acid in the lower layers. Runoff is slow. The soil warms early in the season and is easily worked. The seasonal high water table is 1 to 4 feet below the surface. During years with normal rainfall, the water table starts to rise in late October and is nearer the surface in January. It starts to drop in April and is generally at a depth of 5 feet or more from June to September.

Most of the acreage of this soil is farmed. Some is used for pasture.

This soil is moderately well suited to cultivated crops. The high sand content makes the soil poorly suited to pasture. The main limitations for crops are a hazard of wind erosion and the restricted rooting depth caused by the seasonal high water table. Providing drainage is a management concern. Windbreak hedges and cover crops help to control the wind erosion hazard. Cover crops help maintain the organic matter content, and plowing under the crop residue helps maintain tilth.

This soil is suited to woodland, and potential productivity is high. The common trees are black oak, white oak, ash, and beech.

The seasonal high water table limits the soil as a site for dwellings with basements and for septic disposal fields. The loose, sandy surface layer is a limitation for recreation uses and provides poor trafficability.

Capability subclass: IIIw.

PfA—Penn silt loam, 0 to 2 percent slopes. This soil is nearly level and well drained. It is on dissected, undulating uplands in South Brunswick, North Brunswick, and Piscataway Townships. Slopes are smooth and uniform. The areas are irregular in shape and range from about 3 to 70 acres.

Typically, the surface layer is dark reddish brown silt loam about 8 inches thick. The subsoil is dark reddish brown and is 17 inches thick. It is silt loam in the upper 12 inches and very shaly silt loam in the lower 5 inches. The substratum is dark reddish brown very shaly silt loam 7 inches thick. Red shale bedrock is at a depth of 32 inches.

Included with this soil in mapping are small areas of Klinesville soils, soils with a surface layer of loam or sandy loam, and soils with slopes of more than 2 percent. Together, they make up as much as 25 percent of the unit, and they generally are managed the same as this Penn soil. Also included are soils that are not so well drained as this Penn soil. They make up as much as 5 percent of the unit.

This Penn soil has moderate to moderately rapid permeability and moderate available water capacity. Natural fertility is medium, and organic matter content is moderate. Runoff is slow, and the erosion hazard is slight. The root zone extends to a depth of 32 inches. In unlimed areas the soil is very strongly acid in the surface layer and subsoil.

This soil is well suited to such cultivated crops as corn, soybeans, hay, fruit, and nursery crops. Maintaining the organic matter content and tilth and controlling erosion are the major management concerns. Most high-

value crops on this soil respond to irrigation. Using crop residue on or in the surface layer and using grasses and legumes in the cropping system help to increase organic matter content. The use of lime and fertilizer helps to offset acidity and increase fertility of the soil. Tilling within the proper moisture range helps to reduce soil compaction and clodding.

This soil is suited to pasture. Establishing and maintaining a mixture of grasses and legumes and the prevention of overgrazing are the major pasture management concerns. The use of proper stocking rates, rotation and deferred grazing, and the use of lime and fertilizer are the main pasture management practices. If the pasture is overgrazed, some of the desirable grasses and legumes die out, and grazing during wet periods often cuts and compacts the surface layer.

This soil is suited to trees, and potential productivity is moderately high. Only a small acreage is wooded. The soil is suited to a variety of trees. Yellow-poplar, red oak, scarlet oak, white oak, black oak, ash, black birch, beech, and hickory are the common important trees. Machine planting is practical on large areas.

This soil is limited for some urban uses because of the depth to bedrock and the permeability. They especially limit the soil as a site for septic tank absorption systems and dwellings with basements.

Capability subclass: IIs.

PfB—Penn silt loam, 2 to 5 percent slopes. This soil is gently sloping and well drained. It is on dissected, undulating uplands in South Brunswick, North Brunswick, and Piscataway Townships. Slopes are smooth and uniform. The areas are irregular in shape and range mainly from 5 to 50 acres.

Typically, the surface layer is dark reddish brown silt loam about 8 inches thick. The subsoil is dark reddish brown and is 17 inches thick. It is silt loam in the upper 12 inches and very shaly silt loam in the lower 5 inches. The substratum is dark reddish brown very shaly silt loam 7 inches thick. Red shale bedrock is at a depth of 32 inches.

Included with this soil in mapping are small areas of Klinesville soils, soils with a surface layer of loam or sandy loam, and soils with slopes of more than 5 percent. Together, they make up as much as 25 percent of the unit, and they generally are managed the same as this Penn soil. Also included are soils that are not so well drained as this Penn soil. They make up as much as 5 percent of the unit.

This Penn soil has moderate to moderately rapid permeability and moderate available water capacity. Natural fertility is medium, and organic matter content is moderate. Runoff is slow, and the erosion hazard is moderate. The root zone extends to a depth of 32 inches. In unlimed areas the soil is very strongly acid in the surface layer and subsoil.

This soil is well suited to such cultivated crops as corn, soybeans, hay, fruit, and nursery crops. Much of the acreage is used for crops. Maintaining organic matter content and tilth and controlling erosion are the major management concerns. Most high-value crops on this soil respond to irrigation. Using crop residue on or in the surface layer and using grasses and legumes in the cropping system help to increase organic matter content. The use of lime and fertilizer helps to offset acidity and increase fertility of the soil. Tilling within the proper moisture range helps to reduce soil compaction and clodding.

This soil is suited to pasture. Establishing and maintaining a mixture of grasses and legumes and the prevention of overgrazing are the major pasture management concerns. The use of proper stocking rates, rotation and deferred grazing, and the use of lime and fertilizer are the main pasture management practices. If the pasture is overgrazed, some of the desirable grasses and legumes die out, and grazing during wet periods often cuts and compacts the surface layer.

This soil is suited to trees, and potential productivity is moderately high. Only a small acreage is wooded. The soil is suited to a variety of trees. Yellow-poplar, red oak, scarlet oak, white oak, black oak, ash, black birch, beech, and hickory are the common important trees. Machine planting is practical on large areas.

This soil is limited for some urban uses because of the depth to bedrock and the permeability. They especially limit the soil as a site for septic tank absorption systems and dwellings with basements.

Capability subclass: IIe.

PhD—Phalanx loamy sand, 2 to 15 percent slopes. This soil is gently sloping to moderately steep and is well drained. It is on side slopes and on caps or divides of knolls or mounts, all in south Brunswick and Old Bridge Townships.

Typically, the surface layer is yellowish red loamy sand 7 inches thick. The subsoil is yellowish red gravelly sandy loam 23 inches thick and is 30 percent angular ironstone fragments. The substratum is red gravelly loamy sand to a depth of 60 inches or more and is up to 40 percent angular ironstone fragments.

Included with this soil in mapping are small areas of soils that are less than 30 percent ironstone fragments in the subsoil; soils that have a surface layer of sand, sandy clay loam, sandy loam, or loam; soils with slopes of less than 2 percent or more than 15 percent; and brown and purple soils. Together, they make up as much as 45 percent of the unit, and they generally are managed the same as this Phalanx soil. Also included are small areas of soils with underlying clay beds. They make up as much as 20 percent of the unit and are under some mounds. The other inclusions are throughout the unit.

The permeability of this Phalanx soil is moderate in the subsoil and moderately rapid in the substratum. Available water capacity is moderate. Organic matter content is low, and natural fertility is medium. Unless the soil has been limed, the surface layer is extremely acid and the subsoil and substratum are very strongly acid. Runoff is medium. Ironstone fragments restrict rooting depth in the soil.

The available water capacity, root restriction, and ironstone fragments limit the use of this soil for crops and pasture.

This soil is suited to trees, and potential productivity is moderately high. Chestnut, white oak, and black oak are common. Stands are fair to poor in stocking and growth.

Slope limits the soil for most recreation uses. The ironstone fragments in the subsoil limit shallow excavations.

Capability subclass: IVs.

PL—Pits, clay. This unit is dominantly spoil that remains in a borrow clay pit after mining has taken place (fig. 6). Some of the pits have been smoothed, and some have mounds.

Included with this unit in mapping are small areas of Keyport, Downer, Hammonton, and Klej soils.

The characteristics of this unit are variable. The water table is within several feet of the surface, and there is a wide range in the texture of the soil.

Some areas of this unit are used for sanitary landfills or for building sites or recreation areas. Onsite investigation is needed to determine the suitability of the unit for any use.

Capability subclass: not assigned.

PM—Pits, sand and gravel. This unit is dominantly the spoil that remains in a borrow or sand or gravel pit after mining has taken place. Some pits have been smoothed, and others have mounds.

Figure 6.—Effects of extreme acidity on steel fencepost in an area of Pits, clay.

Included with this unit in mapping are small areas of Keyport, Downer, Hammonton, and Klej soils.

The characteristics of this unit are variable. The water table is within several feet of the surface, and there is a wide range in the texture of the soil.

Some areas of this unit are used for sanitary landfills or for building sites or recreation areas. Onsite investigation is needed to determine the suitability of the unit for any use.

Capability subclass: not assigned.

PN—Psamments, nearly level. This unit consists of deep, well drained or moderately well drained soils dominantly in regraded sand pits or borrow areas that have been smoothed.

The thickness of the fill material in this unit is as much as 48 inches, but in most areas it is about 24 inches. The content of pebbles is as much as 50 percent, but the dominant range is 5 to 20 percent. The other characteristics of the unit are variable, and there is a wide range in texture of the soil.

Some areas of this unit are used for building sites, but the variability of the unit makes onsite investigation necessary to determine the suitability of the unit for any use.

Capability subclass: not assigned.

PO—Psamments, sulfidic substratum. This unit is deep to shallow, moderately well drained and somewhat poorly drained soils that consist of dredged material, principally from the South River and the Raritan River, that has been placed on adjoining Sulfaquents or Sulfihemists. The surface has been smoothed, and most areas are nearly level.

Included with this unit in mapping are areas of Sulfaquents and Sulfihemists and Atsion and Klej soils. Nearly all of those soils have no vegetation.

The characteristics of the unit are variable, and there is a wide range in the texture and thickness of the soil. The areas that are near the point of deposition are as much as 4 feet thick and have a large content of gravel and cobblestones. The material that is farther from the point of deposition is as thin as a few inches and ranges in texture from sand to silt and clay.

Because of the variability of the characteristics, onsite investigation is needed to determine the suitability of this unit for any use.

Capability subclass: not assigned.

PW—Psamments, waste substratum. This unit consists of excessively drained to well drained soils that mainly have been used to cover landfills. The surface in most places is smoothed, and the areas are nearly level or gently sloping.

Included with this unit in mapping are areas of Sulfaquents and Sulfihemists, most of which are used for landfills.

The characteristics of this unit are variable. The material generally is 2 to 4 feet thick and covers layers of soil and household and industrial trash. Onsite investigation is needed to determine the suitability of this unit for any use.

Capability subclass: not assigned.

ReA—Reaville silt loam, 0 to 2 percent slopes. This soil is nearly level and moderately well drained. It is on side slopes, divides, and toe slopes, principally in Piscataway, Edison, and North Brunswick Townships. Slopes are smooth or convex. The areas are irregular in shape and range from 50 to 100 acres.

Typically, the surface layer is dark reddish brown silt loam about 10 inches thick. The subsoil is light reddish brown and reddish brown shaly silt loam about 12 inches thick. The substratum is reddish brown shaly silt loam 6 inches thick. Reddish brown, partially weathered shale bedrock is at a depth of 28 inches.

Included with this soil in mapping are small areas of Ellington Variant, Lansdowne, and Klinesville soils. They make up as much as 25 percent of the unit and generally are managed the same as this Reaville soil. Also included are small areas of Rowland soils that make up as much as 5 percent of the unit. The Rowland soils are in drainageways mainly in Piscataway Township. The Ellington Variant soils are mainly at the heads of streams and on stream terraces principally in Piscataway and South Plainfield Townships. The Lansdowne and Klinesville soils are throughout the unit.

The permeability of this Reaville soil is moderate to slow. Available water capacity is moderate. This soil is subject to severe frost heaving. The subsoil is friable to firm. Excess water is perched in the subsoil in winter and early spring and following heavy rains. Runoff is slow, and the erosion hazard is slight. Root penetration is restricted by the shale bedrock. Natural fertility is medium, and organic matter content is moderate. In unlimed areas the surface layer and subsoil are slightly acid.

If drained, this soil is suitable for cultivated crops, but only a small acreage is farmed. The common cultivated crops are corn, soybeans, tomatoes, cabbage, and other vegetables. Wetness is the main limitation. The soil cannot be worked early because of excess water in the subsoil, and tilth is difficult to maintain unless organic matter content is maintained. If worked when wet, this soil tends to crust and puddles form on the surface. If this soil is cultivated, conservation tillage and using cover crops and grasses and legumes in the cropping system are practices that help to reduce runoff, control erosion, and maintain tilth. Using crop residue makes the soil more friable. Tilling within the proper range of moisture content reduces soil compaction and clodding.

If drained, this soil is suited to pasture. Overgrazing is a main concern of pasture management. Use of proper stocking rates, rotation and deferred grazing, and

restricted grazing during wet periods are the main pasture management practices.

This soil is suited to trees, and potential productivity is moderate. The soil is suited to a variety of trees, mainly yellow-poplar, upland oaks, sweetgum, and red maple. Seasonal wetness limits the use of timber equipment several months of the year.

The seasonal high water table and the depth to bedrock are the main limitations of the soil for community development. They especially limit the soil as a site for onsite septic systems, dwellings with basements, and local roads and streets.

Capability subclass: IIIw.

ReB—Reaville silt loam, 2 to 5 percent slopes. This soil is gently sloping and moderately well drained. It is on side slopes, divides, and toe slopes, principally in Piscataway and Edison Townships. Slopes are smooth or convex. The areas are irregular in shape and range from 5 to 100 acres.

Typically, the surface layer is dark reddish brown silt loam about 10 inches thick. The subsoil is light reddish brown and reddish brown shaly silt loam about 12 inches thick. The substratum is reddish brown shaly silt loam 6 inches thick. Reddish brown, partially weathered shale bedrock is at a depth of 28 inches.

Included with this soil in mapping are small areas of Ellington Variant, Lansdowne, and Klinesville soils. They make up as much as 25 percent of the unit and generally are managed the same as this Reaville soil. Also included are small areas of Rowland soils that make up as much as 5 percent of the unit. The Rowland soils are in drainageways mainly in Piscataway Township. The Ellington Variant soils are mainly at the heads of streams and on stream terraces principally in Piscataway and South Plainfield Townships. The Lansdowne and Klinesville soils are throughout the unit.

The permeability of this Reaville soil is moderate to slow. Available water capacity is moderate. This soil is subject to severe frost heaving. The subsoil is friable to firm. Excess water is perched in the subsoil in winter and early spring and following heavy rains. Runoff is moderate, and the erosion hazard is slight. Root penetration is restricted by the shale bedrock. Natural fertility is medium, and organic matter content is moderate. In unlimed areas the surface layer and subsoil are slightly acid.

This soil is suited to such cultivated crops as corn, soybeans, tomatoes, cabbage, and other vegetables. Only a small acreage is farmed. Alfalfa is short lived because of seasonal wetness. Wetness is the major management concern. The soil cannot be worked early because of excess water in the subsoil, and tilth is difficult to maintain. If this soil is cultivated, conservation tillage and the use of cover crops and grasses and legumes in the cropping system are practices that help to reduce runoff, control erosion, and maintain tilth. Using crop residue makes the soil more friable. Tilling within the proper range of moisture content reduces soil compaction and clodding.

This soil is suited to tall-grass or permanent pasture. Establishing and maintaining a mixture of grasses and legumes, the use of proper stocking rates, rotational and deferred grazing, restricted grazing during wet periods, the use of lime and fertilizer, and the use of drainage are the chief management practices.

The soil is moderately well suited to trees, and potential productivity is moderate. The soil is suited to a variety of trees, mainly yellow-poplar, upland oaks, sweet gum and red maple. The soil is managed for hardwoods. Seasonal wetness limits the use of timber equipment during winter and early spring.

The seasonal high water table and the depth to bedrock are the main limitations of the soil for community development. They especially limit the soil as a site for onsite septic systems, dwellings with basements, and local roads and streets.

Capability subclass: IIIw.

RFA—Reaville-Urban land complex, 0 to 5 percent slopes. This unit consists mainly of nearly level to gently sloping, moderately well drained Reaville soils and areas that are used for urban development. The unit is on flats, terraces, and side slopes, principally in Piscataway and North Brunswick Townships. Slopes are smooth. The areas are irregular in shape and range from 20 to 400 acres. The soils and urbanized areas are in such an intricate pattern that it was not practical to map them separately.

About 40 percent of this unit is areas of Reaville soils. Typically, they have a surface layer of dark reddish brown silt loam about 8 inches thick. The subsoil is light reddish brown and reddish brown shaly silt loam about 12 inches thick. The substratum is reddish brown very shaly silt loam 8 inches thick. Red shale bedrock is at a depth of 28 inches.

About 40 percent of this unit is areas covered mainly by concrete, asphalt, buildings, or other structures.

Included with this soil in mapping are small areas of Ellington Variant, Lansdowne, and Klinesville soils and areas of soils that have been covered by more than 20 inches of fill material, commonly from adjacent areas of Downer soils that have been cut or graded. Together, they make up as much as 15 percent of the unit, and they generally are managed the same as this Reaville soil. Also included are small areas of Rowland soils. They make up as much as 5 percent of the unit and are in drainageways principally in Piscataway Township. The Ellington Variant soils are mainly at the heads of streams and on stream terraces, principally in Piscataway and South Plainfield Townships. The Lansdowne and Klinesville soils are throughout the unit.

The permeability in these Reaville soils is moderate to slow. Runoff is medium, and the hazard of erosion is

moderate. Available water capacity is moderate. Excess water is perched in the subsoil during wet periods. Most unlimed areas are slightly acid.

The undisturbed areas of soils in this unit are mainly in yards and around and between structures. Those areas range from 500 to 7,000 square feet. The soils and fill in those areas are generally suitable for lawns, shade trees, ornamental trees, shrubs and vines, and vegetable gardens. The areas that have been disturbed generally are sandy and droughty and have poor suitability for plants, trees, and grasses.

Capability subclass: not assigned.

Rh—Reaville Variant silt loam. This soil is level or nearly level and is poorly drained. It is mainly on convex slopes and oblong flats or depressions at the upper end of streams and adjacent to the stream heads, principally in South Brunswick, Piscataway, and North Brunswick Townships. Some areas border drainageways. Slopes range from 0 to 2 percent. The areas range from 10 to 100 acres.

Typically, the surface layer is dark reddish brown silt loam about 8 inches thick. The upper part of the subsoil is mottled, gray, firm silty clay loam about 12 inches thick. The lower part is mottled, reddish brown silty clay loam about 5 inches thick. The substratum is dark reddish brown very shaly silty clay loam 5 inches thick. Red shale bedrock is at a depth of 30 inches.

Included with this soil in mapping are small areas of soils with red shale bedrock at a depth of less than 20 inches, soils with a surface layer of sandy loam, soils with small amounts of gravel in the subsoil, and Rowland soils. Together, they make up as much as 20 percent of the unit, and they generally are managed the same as this Reaville Variant soil. Also included are small areas of Reaville, Chalfont, and Lansdowne Variant soils that make up as much as 20 percent of the unit. The soils with a surface layer of sandy loam and the Lansdowne Variant soils commonly are in Piscataway Township. The soils that are less than 20 inches deep to red shale bedrock are commonly along the edges of the unit. The Rowland soils are along drainageways. The Chalfont soils are principally in South Brunswick Township. The Reaville soils and gravelly soils are throughout the unit.

The permeability of this Reaville Variant soil is moderate to moderately slow. Available water capacity is high. Runoff is slow, and the erosion hazard is slight. The depth to bedrock is 20 to 40 inches. Natural fertility is medium. Organic matter content is moderate. The root zone extends to a depth of about 30 inches. Unless limed, the soil ranges from medium acid near the surface to strongly acid in the subsoil. During winter and spring this soil has a seasonal high water table spring between the surface and a depth of 6 inches.

Because of the high water table this soil is poorly suited to cultivated crops. Providing drainage is the main management concern. The use of lime and fertilizer reduces acidity and maintains fertility. If the soil is cultivated, the use of cover crops, crop residue, and grasses and legumes in the cropping system will help to increase organic matter content and maintain tilth.

If drained, this soil is fairly suited to tall-grass or permanent bluegrass pastures. Use of proper stocking rates, rotation grazing, periodic applications of lime and fertilizer, and drainage are the major management practices.

This soil is suited to woodland. Potential productivity is moderately high. The water table limits the use of equipment for woodland management, and rooting depth is restricted by the firm part of the subsoil. The common trees are pine, oak, red maple, white ash, swamp white oak, and black birch.

Seasonal wetness, the permeability, and a severe frost-action potential limit the soil as a site for onsite sewage disposal, dwellings with basements, and local roads and streets.

Capability subclass: IVw.

Ro—Rowland silt loam. This soil is nearly level and moderately well drained or somewhat poorly drained. It is on flood plains along streams and large drainageways. It extends to the toe slopes of the valley sides. Slopes are smooth or convex. The areas are long and narrow and range from 5 to 100 acres.

Typically, the surface layer is brown silt loam about 7 inches thick. The subsoil is dark brown and reddish brown silt loam 33 inches thick. The substratum is gray silt loam and dark gray sandy loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of soils with a clayey subsoil or a surface layer of fine sandy loam, soils that are more than 50 percent fine gravel, soils that have moderately rapid permeability, soils that have low available water capacity, and very strongly acid soils. Also included are small areas of Ellington Variant soils and soils with red shale bedrock at a depth of less than 60 inches. Together, they make up as much as 25 percent of the unit, and they generally are managed the same as this Rowland soil. Also included are small areas that are not flooded. They make up as much as 10 percent of the unit. The soils with more clay in the subsoil are along the Raritan River. The remaining inclusions are throughout the unit.

The permeability of this Rowland soil is moderate or moderately slow. Available water capacity is high. The water table is at a depth of 1 foot to 3 feet from late winter to early spring. The rooting depth is restricted by the seasonal high water table. Runoff is slow, and the erosion hazard is slight. Flooding usually occurs at least once a year (fig. 7). In unlimed areas the surface layer is medium acid and the subsoil is strongly acid.

Flooding limits this soil for cultivation, and artificial drainage is needed for optimum crop production. This soil is moderately well suited to pasture.

Figure 7.—Rowland silt loam in Johnson Park after a heavy rainfall in early spring.

The soil is well suited to a variety of trees, mainly scarlet oak, pine, white oak, sweet gum, ash, and red maple. Potential productivity is high, and much of the acreage is wooded. Seasonal wetness and flooding are the main limitations.

The seasonal high water table and flooding limit the soil for many urban uses.

Capability subclass: Vw.

SaA—Sassafras sandy loam, 0 to 2 percent slopes. This soil is nearly level and well drained. It is on high terraces and divides in Monroe, East Brunswick, Plainsboro, and South Brunswick Townships. Slopes are smooth or convex. The areas are irregular in shape and range from 5 to 200 acres.

Typically, the surface layer is dark brown sandy loam about 8 inches thick. The subsurface layer is yellowish brown sandy loam about 9 inches thick. The subsoil is about 25 inches thick. It is yellowish brown and strong brown sandy clay loam and strong brown sandy loam. The substratum is strong brown gravelly loamy sand and extends to a depth of 60 inches or more.

Included with this soil in mapping are small areas of soils with a surface layer and subsoil of loam or gravelly sandy loam and soils containing small amounts of glauconite. They make up as much as 15 percent of the unit and generally are managed the same as this Sassafras soil. Also included are small areas of Woodstown and Fallsington soils that make up as much as 10 percent of the unit. The Woodstown and Fallsington soils and the soils with a surface layer of loam mainly are in slight pockets or drainageways. The other inclusions are throughout the unit.

The permeability in this Sassafras soil is moderate in the subsoil and moderately rapid in the substratum. Available water capacity is moderate. Runoff is slow, and the erosion hazard is slight. Natural fertility is medium, and organic matter content is moderate. Tilth is good,

and this soil is easily worked. The root zone extends to a depth of 60 inches. In unlimed areas the surface layer and the subsoil are very strongly acid.

This soil is well suited to cultivated crops, and most of the acreage is farmed. The soil is suitable for such cultivated crops as corn, soybeans, hay, fruit, nursery crops, and vegetables. Most high-value crops respond well to irrigation. The soil can be worked fairly early, and tilth is easy to maintain. Controlling erosion and increasing organic matter content are major management concerns. If this soil is cultivated, conservation tillage and the use of cover crops and grasses and legumes in the cropping system help to reduce runoff, control erosion, and maintain tilth. Using crop residue reduces clodding and crusting. Tilling within the proper range of moisture content reduces soil compaction and clodding.

Establishing and maintaining a mixture of grasses and legumes and the prevention of overgrazing are the main concerns of pasture management. The use of proper stocking rates, rotation and deferred grazing, and the periodic use of lime and fertilizer are the main pasture management practices.

This soil is well suited to trees, and some of the acreage is wooded. Yellow-poplar, red oak, scarlet oak, white oak, black oak, ash, black birch, beech, sweet gum, and hickories are the common important trees. Potential productivity is high.

This soil has few or no limitations for urban uses, but the permeability limits the soil as a site for waste disposal.

Capability class: I.

SaB—Sassafras sandy loam, 2 to 5 percent slopes. This soil is gently sloping and well drained. It is on high terraces and divides and side slopes, principally in Monroe, Cranbury, South Brunswick, East Brunswick, and Plainsboro Townships. Slopes are smooth or convex. The areas are irregular in shape and range from 5 to 200 acres.

Typically, the surface layer is dark brown sandy loam about 8 inches thick. The subsurface layer is yellowish brown sandy loam about 9 inches thick. The subsoil is about 25 inches thick. It is yellowish brown and strong brown sandy clay loam and strong brown sandy loam. The substratum is strong brown gravelly loamy sand and extends to a depth of 60 inches or more.

Included with this soil in mapping are small areas of soils with a surface layer and subsoil of loam, soils that are gravelly sandy loam and loam, soils with slopes of more than 5 percent or less than 2 percent, and soils containing small amounts of glauconite. Together, they make up as much as 20 percent of the unit, and they generally are managed the same as this Sassafras soil. Also included are small areas of Woodstown and Fallsington soils and a few soils on knolls with a surface layer of loamy sand or gravelly loamy sand. They make up as much as 10 percent of the unit. The Woodstown and Fallsington soils and the loamy soils mainly are in slight pockets and drainageways. The remaining inclusions are throughout the unit.

The permeability in this Sassafras soil is moderate in the subsoil and moderately rapid in the substratum. Available water capacity is moderate. Runoff is medium, and the erosion hazard is slight. Natural fertility is medium, and organic matter content is moderate. The root zone extends to a depth of about 60 inches. In unlimed areas the surface layer and the subsoil are very strongly acid.

This soil is well suited to cultivated crops, and most of the acreage is farmed. The soil is suitable for such cultivated crops as corn, soybeans, hay, fruit, nursery crops, and vegetables. Most high-value crops respond well to irrigation. The soil can be worked fairly early, and tilth is easy to maintain. Controlling erosion and increasing organic matter content are major management concerns. If this soil is cultivated, conservation tillage and the use of cover crops and grasses and legumes in the cropping system help to reduce runoff, control erosion, and maintain tilth. Using crop residue reduces clodding and crusting. Tilling within the proper range of moisture content reduces soil compaction and clodding.

Establishing and maintaining a mixture of grasses and legumes and the prevention of overgrazing are the main concerns of pasture management. The use of proper stocking rates, rotation and deferred grazing, and the periodic use of lime and fertilizer are the main pasture management practices.

This soil is well suited to trees, and some of the acreage is wooded. Yellow-poplar, red oak, scarlet oak, white oak, black oak, ash, black birch, beech, sweet gum, and hickories are the common important trees. Potential productivity is high.

This soil has few or no limitations for urban uses, but the permeability limits the soil as a site for waste disposal.

Capability subclass: IIe.

SaC—Sassafras sandy loam, 5 to 10 percent slopes. This soil is sloping and well drained. It is on high terraces and divides and side slopes, principally in Monroe, Cranbury, South Brunswick, East Brunswick, and Plainsboro Townships. Slopes are smooth or convex. The areas are irregular in shape and range from 5 to 200 acres.

Typically, the surface layer is dark brown sandy loam about 8 inches thick. The subsurface layer is yellowish brown sandy loam about 9 inches thick. The subsoil is about 25 inches thick. It is yellowish brown and strong brown sandy clay loam and strong brown sandy loam. The substratum is strong brown gravelly loamy sand and extends to a depth of 60 inches or more.

Included with this soil in mapping are small areas of soils with a surface layer and subsoil of loam or gravelly sandy loam and soils containing small amounts of glauconite. They make up as much as 15 percent of the unit and generally are managed the same as this Sassafras soil. Also included are small areas of Woodstown and Fallsington soils that make up as much as 10 percent of the unit. The Woodstown and Fallsington soils and the soils with a surface layer of loam mainly are in shallow pockets or drainageways. The other inclusions are throughout the unit.

The permeability in this Sassafras soil is moderate in the subsoil and moderately rapid in the substratum. Available water capacity is moderate. Runoff is medium, and the erosion hazard is moderate. Natural fertility is medium, and organic matter content is moderate. Tilth is good, and this soil is easily worked. The root zone extends to a depth of 60 inches. In unlimed areas the surface layer and the subsoil are very strongly acid.

This soil is suited to cultivated crops, and most of the acreage is farmed. The soil is suited to such cultivated crops as corn, soybeans, hay, fruit, nursery crops, and vegetables. The soil can be worked fairly early. Tilth is easy to maintain. Controlling erosion and increasing the organic matter content are major management concerns. Most high-value crops, including hay, respond well to irrigation. If this soil is cultivated, conservation tillage and the use of cover crops and grasses and legumes in the cropping system help to reduce runoff, control erosion, and maintain tilth.

Establishing and maintaining a mixture of grasses and legumes and the prevention of overgrazing are the main concerns of pasture management. The use of proper stocking rates, rotation and deferred grazing, and the periodic use of lime and fertilizer are the main pasture management practices.

This soil is well suited to trees, and some of the acreage is wooded. Yellow-poplar, red oak, scarlet oak, white oak, black oak, ash, black birch, beech, sweet gum, and hickories are the common important trees. Potential productivity is high.

Slope limits this soil for some urban uses. The permeability in the substratum limits the soil as a site for waste disposal.

Capability subclass: IIIe.

SgB—Sassafras gravelly sandy loam, 2 to 5 percent slopes. This soil is gently sloping and well drained. It is on high terraces and divides and side slopes, principally in Monroe, Cranbury, South Brunswick, East Brunswick, and Plainsboro Townships. Slopes are smooth or convex. The areas are irregular in shape and range from 5 to 200 acres.

Typically, the surface layer is dark brown gravelly sandy loam about 8 inches thick. The subsurface layer is yellowish brown sandy loam about 9 inches thick. The subsoil is about 25 inches thick. It is yellowish brown and strong brown sandy clay loam and strong brown sandy loam. The substratum is strong brown gravelly loamy sand and extends to a depth of 60 inches or more.

Included with this soil in mapping are small areas of soils with a surface layer and subsoil of loam or gravelly loam and soils containing small amounts of glauconite. They make up as much as 20 percent of the unit and generally are managed the same as this Sassafras soil. Also included are small areas of Woodstown, Downer, Matapeake, Mattapex, and Fallsington soils and a few knolls of gravelly loamy sand. The Woodstown and Mattapex soils are mainly in shallow pockets and drainageways and make up as much as 10 percent of the unit.

The permeability in this Sassafras soil is moderate in the subsoil and moderately rapid in the substratum. Available water capacity is moderate. Runoff is medium, and the erosion hazard is slight. Natural fertility is medium, and organic matter content is moderate. The root zone extends to a depth of about 60 inches. In unlimed areas the surface layer and subsoil are very strongly acid.

This soil is well suited to cultivated crops, and most of the acreage is farmed. The soil is suitable for such crops as corn, soybeans, hay, fruit, and some types of vegetables. The gravel in the soil limits the use of machinery for planting nursery stock and harvesting potatoes and tomatoes. Most high-value crops, including hay, respond well to irrigation. Controlling erosion and increasing organic matter content are main management concerns. If this soil is cultivated, conservation tillage and the use of cover crops and grasses and legumes in the cropping system help to reduce runoff, control erosion, and increase organic matter content.

Establishing and maintaining a mixture of grasses and legumes and the prevention of overgrazing are the main concerns of pasture management. The use of proper stocking rates, rotation and deferred grazing, and the periodic use of lime and fertilizer are the main pasture management practices.

This soil is well suited to trees, and some of the acreage is wooded. Yellow-poplar, red oak, scarlet oak, white oak, black oak, ash, black birch, beech, sweet gum, and hickories are the common important trees. Potential productivity is high.

The permeability in the subsoil is a limitation of this soil as a site for waste disposal. The slope and gravel content limit recreation uses.

Capability subclass IIe.

SgC—Sassafras gravelly sandy loam, 5 to 10 percent slopes. This soil is gently sloping and well drained. It is on high terraces and divides and side slopes, principally in Monroe, Cranbury, South Brunswick, East Brunswick, and Plainsboro Townships. Slopes are smooth or convex. The areas are irregular in shape and range from 5 to 200 acres.

Typically, the surface layer is dark brown gravelly sandy loam about 8 inches thick. The subsurface layer is yellowish brown sandy loam about 9 inches thick. The subsoil is about 25 inches thick. It is yellowish brown and strong brown sandy clay loam and strong brown sandy loam. The substratum is strong brown gravelly loamy sand and extends to a depth of 60 inches or more.

Included with this soil in mapping are small areas of soils with a surface layer and subsoil of loam or gravelly loam and soils containing small amounts of glauconite. They make up as much as 20 percent of the unit and generally are managed the same as this Sassafras soil. Also included are small areas of Woodstown, Downer, Matapeake, Mattapex, and Fallsington soils and a few knolls of gravelly loamy sand. The Woodstown and Mattapex soils are mainly in shallow pockets and drainageways and make up as much as 10 percent of the unit.

The permeability in this Sassafras soil is moderate in the subsoil and moderately rapid in the substratum. Available water capacity is moderate. Runoff is medium, and the erosion hazard is moderate. Natural fertility is medium, and organic matter content is moderate. The root zone extends to a depth of about 60 inches. In unlimed areas the surface layer and subsoil are very strongly acid.

This soil is well suited to cultivated crops, and most of the acreage is farmed. The soil is suitable for such crops as corn, soybeans, hay, fruit, and some types of vegetables. The gravel in the soil limits the use of machinery for planting nursery stock and harvesting potatoes and tomatoes. Most high-value crops, including hay, respond well to irrigation. Controlling erosion and increasing organic matter content are main management concerns. If this soil is cultivated, conservation tillage and the use of cover crops and grasses and legumes in the cropping system help to reduce runoff, control erosion, and increase organic matter content.

Establishing and maintaining a mixture of grasses and legumes and the prevention of overgrazing are the main concerns of pasture management. The use of proper stocking rates, rotation and deferred grazing, and the periodic use of lime and fertilizer are the main pasture management practices.

This soil is well suited to trees, and some of the acreage is wooded. Yellow-poplar, red oak, scarlet oak, white oak, black oak, ash, black birch, beech, sweet gum, and hickories are the common important trees. Potential productivity is high.

The permeability in the subsoil is a limitation of this soil as a site for waste disposal. The slope and gravel content limit recreation uses.

Capability subclass: IIIe.

SgD—Sassafras gravelly sandy loam, 10 to 15 percent slopes. This soil is strongly sloping and well drained. It is on side slopes principally in Monroe and East Brunswick Townships. Slopes are concave or convex and range in length from 50 to 300 feet. The areas are irregular in shape and range from 5 to 200 acres.

Typically, the surface layer is dark brown gravelly sandy loam about 3 inches thick. The subsurface layer is yellowish brown sandy loam about 7 inches thick. The subsoil is about 20 inches thick. It is yellowish brown and strong brown sandy clay loam and strong brown sandy loam. The substratum is strong brown gravelly loamy sand to a depth of 60 inches or more.

Included with this soil in mapping are small areas of soils with slopes of more than 15 percent and soils with a surface layer of sandy loam, gravelly loamy sand, or loamy sand. They make up as much as 25 percent of the unit and generally are managed the same as this Sassafras soil. Also included are small areas of soils that are less than 26 inches deep to the substratum. They make up as much as 20 percent of the unit.

The permeability of this Sassafras soil is moderate in the subsoil and moderately rapid in the substratum. Available water capacity is moderate. Runoff is very rapid, and the erosion hazard is severe. The root zone extends to a depth of 60 inches. Natural fertility is medium, and organic content is moderate. In unlimed areas the surface layer and subsoil are very strongly acid.

Most of the acreage of this soil is wooded or in native vegetation.

This soil is poorly suited to cultivated crops because of the slope, the high gravel content, and the erosion hazard. The slope and erosion hazard make this soil better suited to close-grown crops or pasture and hay than to row crops. The need to increase organic matter content is a major management concern. If this soil is cultivated, conservation tillage, contour stripcropping, and the use of cover crops and grasses and legumes in the cropping system are practices that help to reduce runoff, control erosion, and maintain tilth. The periodic use of lime and fertilizer offsets the acidity and increases fertility.

Establishing and maintaining a mixture of grasses and legumes and the prevention of overgrazing are the main concerns of pasture management. The use of proper stocking rates, rotation and deferred grazing, and the periodic use of lime and fertilizer are the main pasture management practices.

This soil is suited to a variety of trees. Yellow-poplar, red oak, scarlet oak, white oak, black oak, beech, ash, and hickories are the common trees. Potential productivity is high.

Slope and the permeability limit this soil as a site for septic tank absorption fields. Slope also limits the soil as site for dwellings and local roads and streets.

Capability subclass: IVe.

SIA—Sassafras loam, 0 to 2 percent slopes. This soil is nearly level and well drained. It is on high terraces and divides principally in Plainsboro, Monroe, South Brunswick, East Brunswick, and Cranbury Townships. Slopes are smooth or convex and uniform. The areas are irregular in shape and range from 5 to 200 acres.

Typically, the surface layer is dark brown loam about 8 inches thick. The subsurface layer is yellowish brown loam about 4 inches thick. The upper part of the subsoil is yellowish brown loam 13 inches thick, and the lower part is strong brown sandy clay loam 6 inches thick. The substratum is yellowish brown gravelly loamy sand to a depth of 60 inches or more.

Included with this soil in mapping are small areas of soils with small amounts of gravel in the surface layer, the subsoil, or the substratum and soils with a surface layer of silt loam or sandy loam. They make up as much as 15 percent of the unit and generally are managed the same as this Sassafras soil. Also included are small areas of soils with a surface layer or subsoil of sandy loam or gravelly sandy loam and small areas of Woodstown and Fallsington soils. They make up as much as 10 percent of the unit. The Woodstown and Fallsington soils commonly are in slight depressions and drainageways or along the edge of the unit. The remaining inclusions are throughout the unit.

The permeability of this Sassafras soil is moderate in the subsoil and moderately rapid in the substratum. Available water capacity is moderate. Runoff is slow, and the erosion hazard is slight. Natural fertility is medium, and the organic matter content is moderate. In unlimed areas the surface layer and subsoil are very strongly acid.

This soil is well suited to cultivated crops, and most of the acreage is farmed (fig. 8). The soil is suitable for such cultivated crops as corn, soybeans, hay, fruit, nursery crops, and vegetables. Most high-value crops respond well to irrigation. The soil can be worked fairly early, and tilth is easy to maintain. Controlling erosion and increasing organic matter content are major management concerns. If this soil is cultivated, conservation tillage and the use of cover crops and grasses and legumes in the cropping system help to reduce runoff, control erosion, and maintain tilth. Using crop residue reduces clodding and crusting. Tilling within the proper range of moisture content reduces soil compaction and clodding.

Establishing and maintaining a mixture of grasses and legumes and the prevention of overgrazing are the main concerns of pasture management. The use of proper stocking rates, rotation and deferred grazing, and the

Figure 8.—Soybeans on Sassafras loam, 0 to 2 percent slopes.

periodic use of lime and fertilizer are the main pasture management practices.

This soil is suited to a variety of trees. Yellow-poplar, red scarlet, white and black oaks, ash, black birch, beech, and hickories are the common important trees. Potential productivity is high.

This soil has few or no limitations for urban uses, but the permeability limits the soil as a site for waste disposal.

Capability class: I.

SlB—Sassafras loam, 2 to 5 percent slopes. This soil is gently sloping and well drained. It is on high terraces and divides principally in Plainsboro, Monroe, South Brunswick, East Brunswick, and Cranbury Townships. Slopes are smooth or convex and uniform. The areas are irregular in shape and range from 5 to 200 acres.

Typically, the surface layer is dark brown loam about 8 inches thick. The subsurface layer is yellowish brown loam about 4 inches thick. The upper part of the subsoil is yellowish brown loam 13 inches thick, and the lower part is strong brown sandy clay loam 6 inches thick. The substratum is yellowish brown gravelly loamy sand to a depth of 60 inches or more.

Included with this soil in mapping are small areas of soils with small amounts of gravel in the surface layer, the subsoil, or the substratum and soils with a surface layer of silt loam or sandy loam. They make up as much as 15 percent of the unit and generally are managed the same as this Sassafras soil. Also included are small areas of soils with a surface layer or subsoil of sandy loam or gravelly sandy loam and small areas of Woodstown and Fallsington soils. They make up as much as 10 percent of the unit. The Woodstown and Fallsington soils commonly are in slight depressions and drainageways or along the edge of unit. The remaining inclusions are throughout the unit.

The permeability of this Sassafras soil is moderate in the subsoil and moderately rapid in the substratum. Available water capacity is moderate. Runoff is slow, and the erosion hazard is slight. Natural fertility is medium, and the organic matter content is moderate. In unlimed areas the surface layer and subsoil are very strongly acid.

This soil is well suited to cultivated crops, and most of the acreage is farmed. The soil is suitable for such cultivated crops as corn, soybeans, hay, fruit, nursery crops, and vegetables. Most high-value crops respond well to irrigation. The soil can be worked fairly early, and tilth is easy to maintain. Controlling erosion and increasing organic matter content are major management concerns. If this soil is cultivated, conservation tillage and the use of cover crops and grasses and legumes in the cropping system help to reduce runoff, control erosion, and maintain tilth. Using crop residue reduces clodding and crusting. Tilling within the proper range of moisture content reduces soil compaction and clodding.

Establishing and maintaining a mixture of grasses and legumes and the prevention of overgrazing are the main concerns of pasture management. The use of proper stocking rates, rotation and deferred grazing, and the periodic use of lime and fertilizer are the main pasture management practices.

This soil is suited to a variety of trees. Yellow-poplar, red oak, scarlet oak, white oak and black oak, ash, black birch, beech, and hickories are the common important trees. Potential productivity is high.

This soil has few or no limitations for urban uses, but the permeability limits the soil as a site for waste disposal.

Capability subclass: IIe.

SMB—Sassafras-Urban land complex, 0 to 5 percent slopes. This unit consists mainly of nearly level to gently sloping, well drained Sassafras soils and areas that are used for urban development. This unit is on Coastal Plain ridges, terraces, and side slopes, principally in East Brunswick, Old Bridge, and Cranbury Townships. Slopes are smooth and uniform. The areas are irregular in shape and range from 20 to 200 acres. The soils and urbanized areas are in such an intricate pattern that it was not practical to map them separately.

About 40 percent of this unit is areas of Sassafras soils. Typically, they have a surface layer of dark brown sandy loam 8 inches thick. The subsurface layer is yellowish brown sandy loam 9 inches thick. The subsoil is 25 inches thick. It is yellowish brown and strong brown sandy clay loam and strong brown sandy loam. The substratum is strong brown gravelly loamy sand to a depth of 60 inches or more.

About 40 percent of this unit is areas covered mainly by concrete, asphalt, buildings, or other structures.

Included with this soil in mapping are small areas of soils with slopes of more than 5 percent; soils with a surface layer or subsoil of loam or gravelly sandy loam; soils more than 45 inches or less than 26 inches thick; soils that have been covered by more than 20 inches of fill material, commonly from adjacent areas of Sassafras soils that have been cut or graded; and areas where most or all of the original soil has been removed. Together, they comprise up to 15 percent of the unit, and they generally are managed the same as these Sassafras soils. Also included are small areas of Woodstown and Fallsington soils. They make up as much as 5 percent of the unit. The Woodstown and Fallsington soils and the loamy soils are mainly in slight pockets and drainageways. The remaining inclusions are throughout the unit.

The permeability of these Sassafras soils is moderate. Runoff is slow, and the hazard of erosion is slight. Available water capacity is moderate. Most unlimed areas are very strongly acid.

The undisturbed areas of soils in this unit are mainly in yards and around and between structures. Those areas range from 500 to 7,000 square feet. The soils and fill in those areas are generally suitable for lawns, shade trees, ornamental trees, shrubs and vines, and vegetable gardens. The areas that have been disturbed generally are sandy and droughty and have poor suitability for plants, trees, and grasses.

Capability subclass: not assigned.

SrA—Shrewsbury sandy loam, 0 to 2 percent slopes. This soil is nearly level and poorly drained. It is on low-lying flats in or beside drainageways in Monroe Township. The slopes are smooth or convex. The areas generally are long and narrow or irregular in shape and range from 10 to 200 acres.

Typically, the surface layer is very dark brown sandy loam 10 inches thick and is 5 percent glauconite. The subsurface soil is mottled, gray sandy loam 9 inches thick and is 5 percent glauconite. The subsoil is mottled, greenish gray loam about 17 inches thick and is 5 percent glauconite. The substratum is greenish gray loamy sand and is 3 to 15 percent glauconite. It extends to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Fallsington that make up as much as 15 percent of the unit and generally are managed the same as this Shrewsbury soil. Also included are small areas of Mullica, Holmdel, Pemberton, and Hammonton soils and frequently flooded Humaquepts. They make up as much as 10 percent of the unit. The Holmdel, Pemberton, and Hammonton soils are on slight knolls. The Humaquepts are in drainageways throughout the unit. The Fallsington and Mullica soils are intermingled with the Shrewsbury soil.

The permeability of this Shrewsbury soil is moderate to moderately slow in the subsoil. Available water capacity is high. This soil is subject to severe frost heaving. The seasonal high water table is between the surface and a depth of 1 foot from late fall to late spring. Runoff is slow, and the erosion hazard is slight. Water is frequently ponded on the surface in late winter and in spring. The rooting zone extends to a depth of 60 inches. Natural fertility is high, and organic matter content is moderate. In unlimed areas the surface layer is extremely acid and the subsoil is very strongly acid.

The seasonal high water table and a lack of suitable drainage outlets make this soil generally unsuitable for most cultivated crops. The main management concerns are wetness, soil reaction, and poor aeration in the subsoil. If artificially drained, this soil is suited to such cultivated crops such as corn, soybeans, and grass-legume hay. This soil warms slowly in the spring. Tilth can be maintained by using cover crops, tilling the soils at optimum moisture content, and using crop residue. The use of lime and fertilizer offsets acidity and increases fertility.

The soil is suited to trees, and potential productivity is high. Yellow-poplar, upland oaks, sweetgum, beech, red maple, and ash are the common trees. Seasonal wetness limits the use of timber equipment during winter and spring.

The high water table limits the soil as a site for most urban uses, such as onsite septic systems, dwellings with basements, and local roads and streets.

Capability subclass: IIIw.

SU—Sulfaquents and Sulfihemists, frequently flooded. This unit consists of level, very poorly drained organic soils mainly along the Raritan River and Raritan Bay in Old Bridge, Edison, Sayreville, Woodbridge, East Brunswick, and New Brunswick Townships. The soils are in tidal marsh areas and are subject to tidal flooding. The vegetation is saltmeadow cordgrass and smooth cordgrass.

Generally, the Sulfaquents have a surface layer of mucky silt loam over a sandy substratum. The Sulfihemists are mucky soils that range in thickness from 18 to 60 inches or more but are typically about 24 inches thick over a sandy substratum.

Included with these soils in mapping are small areas of Atsion, Mullica, and Fallsington soils. These inclusions make up about 15 percent of the unit. Also included are small areas of Psamments, sulfidic substratum, and Psamments, waste substratum. They make up as much as 10 percent of the unit.

The permeability of this unit is moderate, and available water capacity is high. The water table is near the surface and fluctuates very little. Reaction of the soil in the moist areas is strongly acid to neutral. If excavated and exposed to oxygen, the organic matter in these soils oxidizes and forms sulfides that become extremely acid. The acidity from the sulfides becomes the dominant soil characteristic.

Most of the acreage of this unit is used for wildlife habitat. The unit is not suitable for farmland, pasture, or woodland.

Flooding and the high water table limit the use of this unit for urban development.

Capability subclass: VIIIw.

TnB—Tinton loamy sand, 0 to 5 percent slopes. This soil is nearly level to gently sloping and is well drained. It is on divides and side slopes in Monroe Tonwship. The slopes are smooth or convex and uniform. The areas generally are long and narrow or irregular in shape and range from 10 to 50 acres.

Typically, the surface layer is yellowish brown loamy sand 18 inches thick. The subsurface layer is yellowish brown loamy sand 16 inches thick. The subsoil is yellowish brown sandy loam 14 inches thick. The substratum consists of yellowish brown loamy sand to a depth of 60 inches or more.

Included with this soil in mapping are small areas of soils similar to this Tinton soil but with more glauconite, a thicker or thinner surface layer, or a surface layer of sandy loam and areas of Fort Mott soils. They make up as much as 25 percent of the unit and generally are managed the same as this Tinton soil. Also included are small areas of Pemberton, Holmdel, and Shrewsbury soils that make up about 15 percent of the unit. They are in depressions or low positions. The other inclusions are throughout the unit.

The permeability of this Tinton soil is moderate or moderately rapid. Available water capacity is moderate. Runoff is slow, and the erosion hazard is moderate. Organic matter content is low, and natural fertility is medium. Tilth is good. In unlimed areas the surface layer is extremely acid and the subsoil and substratum are very strongly acid. The depth to the substratum ranges from 20 to 36 inches but is generally 24 to 30 inches.

This soil is suited to cultivated crops, pasture, or woodland. Vegetables and fruits are the common crops. The main management concerns are the hazard of erosion, low fertility, droughtiness, and the need to increase the organic matter content. Soil blowing is severe if areas are unprotected in winter. Using crop residue maintains or increases organic matter content and reduces soil blowing. The use of lime and fertilizer offsets acidity and low fertility. Conservation tillage and the use of cover crops and grasses and legumes in the cropping system help to reduce runoff and erosion.

This soil is suited to pasture, but the moderate available water capacity is a limitation. Proper seeding, proper stocking, and rotation grazing are the major management practices on this soil.

This soil is suited to trees, and potential productivity is moderately high. Black oak, white oak, and scarlet oak are common in most places, but pines are common where fields have been left idle. Protection from fire is the major management concern.

This soil is generally suitable for most urban uses. The texture of the surface layer and substratum limit the soil as a site for lawns, landscaping, and golf fairways. Some recreation uses are limited by slope.

Capability subclass: IIIs.

UB—Udorthents, bedrock substratum. This unit is nearly level to gently sloping. The areas are irregular in shape and range mainly from 2 to 15 acres. Most areas are smaller than 5 acres. The most extensive areas are principally in Edison, New Brunswick, and North Brunswick Townships.

This unit has been cut and smoothed or otherwise extensively disturbed to a depth of 3 feet or more. The original soil has been removed.

Included with this unit in mapping are small areas of Klinesville, Reaville, Reaville Variant, and Ellington soils on uplands and along the perimeter of the disturbed areas. Small areas of Udorthents, wet substratum, and Urban land are also included.

Some areas of this unit are in native vegetation. Some areas are used for parking lots, landfills, or recreation areas. The variability of the characteristics of this unit makes onsite investigation necessary to determine the suitability of the unit for any use.

Capability subclass: not assigned.

UC—Udorthents, clayey substratum. This unit consists of deep, moderately well drained to somewhat poorly drained soils mostly in regraded clay pits or borrow areas. The surface has been smoothed, and the areas are nearly level.

Most areas of this unit are used for residential, commercial, or industrial development. The variability of the characteristics of the unit makes onsite investigation necessary to determine the suitability of the unit for any use.

Capability subclass: not assigned.

UD—Udorthents, wet substratum-Urban land complex. This unit consists of moderately deep, moderately well drained, loamy soil and urbanized areas. The areas are principally in housing developments or apartment complexes. They dominantly are graded spoil excavated for cellars or foundations or that has been trucked in from nearby areas.

The Udorthents in this unit have a seasonal high water table near the surface. In some areas fill material has been used to cover the water table and thus improve the suitability of the unit as a building site. The thickness of the fill material is 2 to 4 feet, and the average thickness is about 30 inches. The Udorthents are mainly in areas of Fallsington Variant, Reaville Variant, and Parsippany Variant soils.

The variability of the characteristics of this unit makes onsite investigation necessary to determine the suitability of the unit for any use.

Capability subclass: not assigned.

UL—Urban land. This unit consists of areas where more than 80 percent of the surface is covered by industrial plants, shopping and business centers, and other structures. These areas are nearly all in the highly populated northern half of the county. The areas generally range from 2 to 1,000 acres. Most are nearly level to moderately sloping, but a few are strongly sloping and steep. Fill material has been used in places to build up wet soils. Most areas have been excavated or filled with material that is now almost totally paved.

Onsite investigation is needed to determine the potentials and limitations of this unit for any use.

Capability subclass: not assigned.

Wa—Watchung very stony silt loam, 0 to 2 percent slopes. This soil is nearly level and poorly drained. It is

on toe slopes and in low-lying flats and basins in South Brunswick Township. Slopes are convex and uniform. The areas are irregular in shape and range from 5 to 100 acres. Stones cover 3 to 15 percent of the surface.

Typically, the surface is covered by about 3 inches of loose leaves and twigs. The surface layer is 8 inches thick. It is dark brown silt loam and mottled, light gray silt loam. The subsoil is mottled, light gray silty clay 29 inches thick. The substratum extends to a depth of 60 inches or more. It is brown to strong brown loam (saprolite) that is mottled in the lower part. The substratum contains 5 to 25 percent rounded diabase or basalt stones or rocks.

Included with this soil in mapping are small areas of Fallsington and Elkton soils that make up as much as 20 percent of the unit. They generally are managed the same as this Watchung soil. Also included are small areas of Mount Lucas, Chalfont, Woodstown, and Manahawkin soils. They make up as much as 15 percent of the unit. The Mount Lucas, Chalfont, and Woodstown soils are on slight knolls. The Manahawkin soils are in drainageways. All the inclusions are small and are throughout the unit.

The permeability of this Watchung soil is slow. Available water capacity is moderate. This soil has a seasonal high water table that is at or near the surface from November to May. This soil is subject to severe frost heaving. The subsoil is firm and has a moderate shrink-swell potential. Runoff is slow, and the erosion hazard is slight. The root zone of most crops extends to a depth of about 27 inches. Natural fertility is medium, and organic matter content is moderate. In unlimed areas the surface layer is strongly acid and the subsoil is medium acid. Some areas of this soil have water ponded on the surface.

The seasonal high water table and a high stone content make this soil generally unsuitable for crops. Because of the high clay content, slow permeability, and large number of stones, underground drains generally are not effective and outlets are difficult to locate. The risk of crop damage remains even after drainage is used. Good tilth is difficult to maintain.

If drained, this soil is suited to tall grass or a permanent pasture of reed canarygrass. Overgrazing of pasture when this soil is wet causes compaction of the surface layer. Use of proper stocking rates and restricted grazing during wet periods are the main management practices.

This soil is suited to trees, and potential productivity is very high. The soil is suited to a variety of trees, mainly yellow-poplar, upland oaks, sweet gum, beech, and red maple. The use of equipment is limited by long wet periods and the stone content of the soil.

The wetness, the slow permeability, and the abundance of stones limit the soil as a site for septic effluent disposal, dwellings with basements, and local roads and streets. The stones also limit the soil for other urban and recreation uses.

Capability subclass: VIIs.

WdA—Woodstown sandy loam, 0 to 2 percent slopes. This soil is nearly level and moderately well drained. It is in slight depressions, in draws, and on terraces of the Coastal Plain, principally in Cranbury, South Brunswick, Monroe, East Brunswick, and Plainsboro Townships. Slopes are smooth to convex. The areas are irregular in shape and range from 5 to 80 acres.

Typically, the surface layer is dark grayish brown sandy loam 8 inches thick. The subsurface layer is yellowish brown sandy loam 4 inches thick. The upper part of the subsoil is mottled, yellowish brown sandy clay loam 13 inches thick. The lower part is mottled, yellowish brown sandy loam 11 inches thick. The substratum is yellowish brown loamy sand to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Sassafras soils and soils with a surface layer of silt loam, loam, or gravelly sandy loam. They make up as much as 30 percent of the unit and generally are managed the same as this Woodstown soil. Also included are small areas of Fallsington and Keyport soils and Humaquepts, frequently flooded. They make up as much as 10 percent of the unit. The Humaquepts, frequently flooded, are commonly in drainageways. All the inclusions are throughout the unit.

The permeability of this Woodstown soil is moderate. Available water capacity is high, and additional water is available seasonally from the water table. Runoff is slow, and the erosion hazard is slight. Tilth is good. Natural fertility is medium, and organic content is moderate. The root zone extends to a depth of 60 inches or more. In unlimed areas the surface layer is extremely acid and the subsoil and substratum are very strongly acid. A seasonal high water table is at a depth of 18 to 30 inches in this soil in late winter and early spring.

This soil is well suited to cultivated crops, and most of it is farmed. The main suitable crops are corn, soybeans, small grains, vegetables, and hay. Alfalfa is short lived because of seasonal wetness. Planting sometimes is delayed because of wetness. For optimum production this soil needs drainage. Conservation tillage, the use of cover crops and grasses and legumes in the cropping system, and the use of crop residue help to increase organic matter content and maintain tilth.

Establishing and maintaining a mixture of grasses and legumes and the prevention of overgrazing are major pasture management concerns. The use of proper stocking rates, rotation and deferred grazing, and the use of lime and fertilizer are the main pasture management practices. Grazing must be deferred during some abnormally wet periods. Subsurface drainage or

open-ditch drains reduce wetness and make this soil suitable for a wide range of pasture plants.

This soil is well suited to woodland, and potential productivity is high. The dominant species are yellow-poplar, red oak, scarlet oak, white oak, black oak, ash, beech, sweet gum, and hickory.

The seasonal high water table limits the soil for most urban uses, especially as a site for septic tank absorption systems, dwelling with basements, and local roads and streets.

Capability subclass: IIw.

WdB—Woodstown sandy loam, 2 to 5 percent slopes. This soil is gently sloping and moderately well drained. It is on the side slopes of depressions and draws and on slight knolls, principally in South Brunswick, Monroe, East Brunswick, and Cranbury Townships. Slopes are concave or convex and uniform. The areas are irregular in shape and range from 5 to 100 acres.

Typically, the surface layer is dark grayish brown sandy loam 8 inches thick. The subsurface layer is yellowish brown sandy loam 4 inches thick. The upper part of the subsoil is mottled, yellowish brown sandy clay loam 13 inches thick. The lower part is mottled, yellowish brown sandy loam 11 inches thick. The substratum is yellowish brown loamy sand to a depth of 60 inches or more.

Included with this soil in mapping are small areas of soils with a surface layer of loam, silt loam, gravelly sandy loam, gravelly loam, or coarse sandy loam; soils with gravel in the subsoil; and soils with no mottles in the subsoil. They make up as much as 30 percent of the unit and generally are managed the same as this Woodstown soil. Also included are small areas of Downer and Keyport soils that make up as much as 15 percent of the unit. They are throughout the unit.

The permeability of this Woodstown soil is moderate. Available water capacity is high and additional water is available seasonally from the water table. Runoff is moderately slow, and the erosion hazard is moderate. Natural fertility is medium, and organic content is moderate. The root zone extends to a depth of 60 inches or more. The surface layer is extremely acid, and the subsoil and substratum are very strongly acid. A seasonal high water table is at a depth of 18 to 30 inches in late winter and early spring.

This soil is well suited to cultivated crops, and most of it is farmed. The main suitable crops are corn, soybeans, small grains, and vegetables. In some years planting is delayed because of wetness, and alfalfa is short lived because of wetness. For optimum production this soil needs drainage, grasses and legumes in the cropping system, and periodic use of lime and fertilizer. The erosion hazard generally can be controlled by the use of cover crops, conservation tillage, and crop residue. Contour farming, stripcropping, and diversions are needed in some areas to help reduce erosion.

Establishing and maintaining a mixture of grasses and legumes and the prevention of overgrazing are major pasture management concerns. The use of proper stocking rates, rotation and deferred grazing, and the use of lime and fertilizer are the main pasture management practices. Grazing must be deferred during some abnormally wet periods. Subsurface drainage or open-ditch drains reduce wetness and make this soil suitable for a wide range of pasture plants.

This soil is well suited to woodland, and potential productivity is high. The dominant species are yellow-poplar, red oak, scarlet oak, white oak, black oak, ash, beech, sweet gum, and hickory.

The seasonal high water table limits the soil for most urban uses, especially as a site for septic tank absorption systems, dwelling with basements, and local roads and streets.

Capability subclass: IIe.

WkA—Woodstown sandy loam, clayey substratum, 0 to 2 percent slopes. This soil is nearly level and moderately well drained. It is on terraces and slight knolls principally in South Brunswick, Monroe, and Old Bridge Townships. Slopes are concave or convex and uniform. The areas are irregular in shape and range from 5 to 100 acres.

Typically, the surface layer is dark grayish brown sandy loam 8 inches thick. The subsurface layer is yellowish brown sandy loam 4 inches thick. The upper part of the subsoil is mottled, yellowish brown and strong brown sandy clay loam 13 inches thick. The lower part is mottled, yellowish brown sandy loam 11 inches thick. The substratum is yellowish brown loamy sand to a depth of 45 inches and is yellowish brown sandy clay from 45 inches to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Keyport, Mount Lucas, and Sassafras soils and thin strata or pockets of gravel. They make up as much as 20 percent of the unit and generally are managed the same as this Woodstown soil. Also included are small areas of Keyport soils, Hammonton soils with a clayey substratum, and Fallsington soils. They make up as much as 15 percent of the unit. They are throughout the unit.

The permeability of this Woodstown soil is moderate in the upper layers and slow in the substratum. Available water capacity is high, and additional water is available seasonally from the water table. Runoff is slow, and the erosion hazard is slight. Natural fertility is medium, and organic content is moderate. The root zone extends to a depth of 45 inches or more. In unlimed areas the surface and subsurface layers are extremely acid and the subsoil and substratum are very strongly acid. A seasonal high water table is at a depth of 18 to 30 inches in late winter and early spring.

This soil is well suited to cultivated crops, but most of it is wooded or in native vegetation. Such crops as corn, soybeans, small grains, and hay are common on this soil. Alfalfa is short lived because of wetness. Water ponds for short periods in depressions, and such areas are usually difficult to drain. Subsurface drains and open ditches are effective, but care must be taken to keep the drains above the clayey part of the substratum. Tilth can be maintained or improved by incorporating organic matter in to the soil and by plowing when the soil has the proper moisture content. The periodic use of lime and fertilizer, the use of cover crops, and the use of drainage are the main management practices.

Establishing and maintaining a mixture of grasses and legumes and the prevention of overgrazing are major pasture management concerns. The use of proper stocking rates, rotation and deferred grazing, and the use of lime and fertilizer are the main pasture management practices. Deferred grazing is needed during some abnormally wet periods. Subsurface drainage or open-ditch drains reduce wetness and make this soil suitable for a wide range of pasture plants.

The soil is well suited to woodland, and potential productivity is high. The dominant species are yellow-poplar, red oak, scarlet oak, white oak, black oak, ash, beech, sweetgum, and hickory.

The seasonal high water table and the slow permeability in the substratum limit this soil for some urban uses. They especially limit the soil as a site for septic tank absorption systems, dwelling with basements, or local roads and streets.

Capability subclass: IIw.

WkB—Woodstown sandy loam, clayey substratum, 2 to 5 percent slopes. This soil is gently sloping and moderately well drained. It is on terraces, side slopes of terraces, depressions, draws, and slight knolls, principally in Monroe and Old Bridge Townships. Slopes are concave or convex and uniform. The areas are irregular in shape and range from 5 to 50 acres.

Typically, the surface layer is dark grayish brown sandy loam 8 inches thick. The subsurface layer is yellowish brown sandy loam 4 inches thick. The upper part of the subsoil is mottled, yellowish brown and strong brown sandy clay loam 13 inches thick. The lower part is mottled, yellowish brown sandy loam 11 inches thick. The substratum is yellowish brown loamy sand to a depth of 45 inches and is yellowish brown sandy clay from 45 inches to a depth of 60 inches or more.

Included with this soil in mapping are small areas of soils with a surface layer of loam or gravelly loam. They make up as much as 20 percent of the unit. Also included are small areas of Keyport soils, Hammonton soils with a clayey substratum, and Fallsington soils. They make up as much as 15 percent of the unit. The inclusions are throughout the unit.

The permeability of this Woodstown soil is moderate in the upper layers and slow in the substratum. Available water capacity is high, and additional water is available seasonally from the water table. Runoff is slow, and the erosion hazard is slight. Natural fertility is medium, and organic content is moderate. The root zone extends to a depth of 45 inches or more. In unlimed areas the surface and subsurface layers are extremely acid and the subsoil and substratum are very strongly acid. A seasonal high water table is at a depth of 18 to 30 inches in late winter and early spring.

This soil is well suited to cultivated crops, but most of it is in native vegetation or woodland. Such crops as corn, soybeans, small grains, vegetables, and hay are common on this soil. For optimum production this soil needs drainage, grasses and legumes in the cropping system, and lime and fertilizer. Subsurface drains and open ditches are effective, but care must be taken to keep the drains above the clayey part of the substratum. This soil has a slight erosion hazard, which can be controlled by the use of cover crops, conservation tillage, crop residue, contour farming, stripcropping, and diversions.

Establishing and maintaining a mixture of grasses and legumes and controlling overgrazing are major pasture management concerns. The use of proper stocking, rotation and deferred grazing, and the use of lime and fertilizer are the main pasture management practices. Deferred grazing is needed during some abnormally wet periods. Subsurface drainage or open-ditch drains reduce the wetness and make this soil suitable for a wide range of pasture plants.

The soil is well suited to woodland, and potential productivity is high. The dominant species are yellow-poplar, red oak, scarlet oak, white oak, black oak, ash, beech, sweetgum, and hickory.

The seasonal high water table and the slow permeability in the substratum limit this soil for some urban uses. They especially limit the soil as a site for septic tank absorption systems, dwelling with basements, or local roads and streets.

Capability subclass: IIe.

WlA—Woodstown loam, 0 to 2 percent slopes. This soil is nearly level and moderately well drained. It is in slight depressions, in draws, and on terraces, principally in South Brunswick, Plainsboro, Cranbury, Monroe, East Brunswick, and North Brunswick Townships. Slopes are smooth or convex and uniform. The areas are irregular in shape and range from 5 to 400 acres.

Typically, the surface layer is a dark grayish brown loam about 8 inches thick. The subsurface layer is yellowish brown loam 4 inches thick. The upper part of the subsoil is mottled, yellowish brown sandy clay loam 13 inches thick. The lower part is mottled, yellowish brown sandy loam 11 inches thick. The substratum is

yellowish brown loamy sand to a depth of 60 inches or more.

Included with this soil in mapping are small areas of soils with a surface layer of silt loam or sandy loam, olive-colored soils, soils with thin gravel beds, and soils without mottles. Together, they make up as much as 20 percent of the unit, and they generally are managed the same as this Woodstown soil. Also included are small areas of Fallsington and Keyport soils and Humaquepts, frequently flooded. They make up as much as 10 percent of the unit. All the inclusions are throughout the unit.

The permeability of this Woodstown soil is moderate. Available water capacity is high, and additional water is available seasonally from the water table. Runoff is slow, and the erosion hazard is slight. Tilth is good. Natural fertility is medium, and organic content is moderate. The root zone extends to a depth of 60 inches or more. In unlimed areas the surface and subsurface layers are extremely acid and the subsoil and substratum are very strongly acid. A seasonal high water table is at a depth of 18 to 30 inches in this soil in late winter and early spring.

This soil is well suited to cultivated crops, and most of it is farmed. The main suitable crops are corn, soybeans, vegetables, small grains, and hay. Alfalfa is short lived because of seasonal wetness. For optimum production this soil needs drainage. Conservation tillage, cover crops, use of crop residue, and grasses and legumes help to increase organic matter content and maintain tilth.

Establishing and maintaining a mixture of grasses and legumes and the prevention of overgrazing are major pasture management concerns. The use of proper stocking rates, rotation and deferred grazing, and the use of lime and fertilizer are the main pasture management practices. Grazing must be deferred during some abnormally wet periods. Subsurface drainage or open-ditch drains reduce wetness and make this soil suitable for a wide range of pasture plants.

The soil is well suited to woodland, and potential productivity is high. The dominant species are yellow-poplar, red oak, scarlet oak, white oak, black oak, ash, beech, sweetgum, and hickory.

The seasonal high water table limits the soil for most urban uses, especially as a site for septic tank absorption systems, dwelling with basements, and local roads and streets.

Capability subclass: IIw.

WIB—Woodstown loam, 2 to 5 percent slopes. This soil is gently sloping and moderately well drained. It is on the side slopes of depressions, draws, and terraces principally in Monroe and South Brunswick Townships. Slopes are smooth or convex and uniform. The areas are irregular in shape and range mainly from 5 to 400 acres.

Typically, the surface layer is a dark grayish brown loam about 8 inches thick. The subsurface layer is yellowish brown loam 4 inches thick. The upper part of the subsoil is mottled, yellowish brown sandy clay loam 13 inches thick. The lower part is mottled, yellowish brown sandy loam 11 inches thick. The substratum is yellowish brown loamy sand to a depth of 60 inches or more.

Included with this soil in mapping are small areas of soils with a surface layer of sandy loam or silt loam, soils with gravel in the subsoil, and soils with a subsoil of sandy loam or with no mottles in the subsoil. They make up as much as 25 percent of the unit, and generally they are managed the same as this Woodstown soil. Also included are small areas of Downer and Keyport soils that make up as much as 15 percent of the unit. They are throughout the unit.

The permeability of this Woodstown soil is moderate. Available water capacity is high, and additional water is available seasonally from the water table. Runoff is moderately slow, and the erosion hazard is moderate. Tilth is good. Natural fertility is medium, and organic content is moderate. The root zone extends to a depth of 60 inches or more. In unlimed areas the surface and subsurface layer are extremely acid and the subsoil and substratum are very strongly acid. A seasonal high water table is at a depth of 18 to 30 inches in this soil in late winter and early spring.

This soil is well suited to cultivated crops. Most of the acreage is farmed, but some has been converted to urban uses. The main suitable crops are corn, soybeans, small grains, vegetables, and hay. Alfalfa is short lived because of seasonal wetness. For optimum production this soil needs drainage. Conservation tillage, cover crops, and the use of crop residue and grasses and legumes help to increase organic matter content, maintain tilth, reduce runoff, and control erosion.

This soil is well suited to pasture. The use of proper stocking rates, rotation and deferred grazing, and the use of lime and fertilizer are the main pasture management practices. Deferred grazing is needed during some abnormally wet periods. Subsurface drainage or open-ditch drains reduce the wetness and make this soil suitable for a wide range of pasture plants.

The soil is well suited to woodland, and potential productivity is high. The dominant species are yellow-poplar, red oak, scarlet oak, white oak, black oak, ash, beech, sweetgum, and hickory.

The seasonal high water table limits the soil for most urban uses, especially as a site for septic tank absorption systems, dwelling with basements, and local roads and streets.

Capability subclass: IIw.

WU—Woodstown-Urban land complex, 0 to 5 percent slopes. This unit consists mainly of nearly level to gently sloping, moderately well drained Woodstown

soils and areas that are used for urban development. This unit is on Coastal Plain ridges, terraces, and side slopes, principally in Monroe, Cranbury, and South Brunswick Townships. Slopes are smooth. The areas are irregular in shape and range from 20 to 200 acres. The soils and urbanized areas are in such an intricate pattern that it was not practical to map them separately.

About 40 percent of this unit is areas of Woodstown soils. Typically, they have a surface layer of dark grayish brown loam about 8 inches thick. The subsurface layer is yellowish brown loam 4 inches thick. The upper part of the subsoil is mottled, yellowish brown sandy clay loam 13 inches thick. The lower part is mottled yellowish brown sandy loam 11 inches thick. The substratum is yellowish brown loamy sand to a depth of 60 inches or more.

About 40 percent of this complex is areas covered mainly by concrete, asphalt, buildings, or other structures.

Included with this soil in mapping are small areas of soils with a surface layer of sandy loam or silt loam; soils with gravel strata in the subsoil; soils with a subsoil of sandy loam or a subsoil without mottles; and soils have been covered by more than 20 inches of fill material, commonly from adjacent areas of Woodstown soils that have been cut or graded. Together, they make up as much as 15 percent of the unit, and they are managed the same as this Woodstown soil. Also included are small areas of Downer and Keyport soils that make up as much as 5 percent of the unit. The inclusions are throughout the unit.

The permeability of these Woodstown soils is moderate. Runoff is slow, and the hazard of erosion is moderate to severe. Available water capacity is moderate to high. Most unlimed areas are very strongly acid.

The undisturbed areas of soils in this unit are mainly in yards and around and between structures. Those areas range from 500 to 7,000 square feet. The soils and fill in those areas are generally suitable for lawns, shade trees, ornamental trees, shrubs and vines, and vegetable gardens. The areas that have been disturbed generally are sandy and droughty and have poor suitability for plants, trees, and grasses.

Capability subclass: not assigned.

Prime Farmland

Prime farmland is one of several kinds of important farmlands defined by the U.S. Department of Agriculture. Identification of prime farmland is a major step in meeting the Nation's needs for food and fiber (fig. 9).

The U.S. Department of Agriculture defines prime farmland as the land that is best suited to producing food, feed, forage, fiber, and oilseed crops. It has the soil quality, growing season, and moisture supply needed to produce a sustained high yield of crops while using acceptable farming methods. Prime farmland produces the highest yields and requires minimal amounts of energy and economic resources, and farming it results in the least damage to the environment.

An area identified as prime farmland must be used for producing food or fiber or must be available for those uses. Thus, urban and built-up land and water areas are not classified as prime farmland.

The general criteria for prime farmland are as follows: a generally adequate and dependable supply of moisture from precipitation or irrigation, favorable temperature and growing-season length, acceptable levels of acidity or alkalinity, few or no rocks, and permeability to air and

Figure 9.—Irrigated vegetables on prime farmland in the southern part of Middlesex County.

water. Prime farmland is not excessively erodible, is not saturated with water for long periods, and is not flooded during the growing season. The slope range is mainly from 0 to 6 percent. For more detailed information on the criteria for prime farmland, consult the local staff of the Soil Conservation Service.

The survey area contains about 57,430 acres of prime farmland. That acreage makes up about 29 percent of the total acreage in the survey area and is mainly in units 1, 2, and 6 on the general soil map.

The soil map units that make up prime farmland in the survey area are listed in this section. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 4, and the location of each unit is shown on the detailed soil maps at the back of this publication. The soil properties and characteristics that affect use and management of the units are described in the section "Detailed soil map units."

The map units that meet the soil requirements for prime farmland are:

BoB Boonton loam, 2 to 5 percent slopes
DoB Downer sandy loam, 2 to 5 percent slopes
DvA Dunellen Variant sandy loam, 0 to 2 percent slopes
DvB Dunellen Variant sandy loam, 2 to 5 percent slopes
EoA Ellington Variant sandy loam, 0 to 2 percent slopes
EoB Ellington Variant sandy loam, 2 to 5 percent slopes
HaA Haledon silt loam, 0 to 2 percent slopes
HaB Haledon silt loam, 2 to 5 percent slopes
HmA Hammonton sandy loam, 0 to 2 percent slopes
HoA Holmdel fine sandy loam, 0 to 2 percent slopes
KeA Keyport sandy loam, 0 to 2 percent slopes
KeB Keyport sandy loam, 2 to 5 percent slopes
KfA Keyport loam, 0 to 2 percent slopes
KfB Keyport loam, 2 to 5 percent slopes
MeA Matapeake silt loam, 0 to 2 percent slopes
MeB Matapeake silt loam, 2 to 5 percent slopes
MgA Mattapex silt loam, 0 to 2 percent slopes
MgB Mattapex silt loam, 2 to 5 percent slopes
MoA Mount Lucas silt loam, 0 to 2 percent slopes
MoB Mount Lucas silt loam, 2 to 5 percent slopes
NaA Nixon loam, 0 to 2 percent slopes
NaB Nixon loam, 2 to 5 percent slopes
NfA Nixon Variant loam, 0 to 2 percent slopes
NfB Nixon Variant loam, 2 to 5 percent slopes
PfA Penn silt loam, 0 to 2 percent slopes
PfB Penn silt loam, 2 to 5 percent slopes
SaA Sassafras sandy loam, 0 to 2 percent slopes
SaB Sassafras sandy loam, 2 to 5 percent slopes
SgB Sassafras gravelly sandy loam, 2 to 5 percent slopes
SlA Sassafras loam, 0 to 2 percent slopes
SlB Sassafras loam, 2 to 5 percent slopes
WdA Woodstown sandy loam, 0 to 2 percent slopes
WdB Woodstown sandy loam, 2 to 5 percent slopes
WkA Woodstown sandy loam, clayey substratum, 0 to 2 percent slopes
WkB Woodstown sandy loam, clayey substratum, 2 to 5 percent slopes
WlA Woodstown loam, 0 to 2 percent slopes
WlB Woodstown loam, 2 to 5 percent slopes

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and Pasture

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed Soil Map Units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

Crops and pasture covered 31,441 acres in the survey area in 1981, according to the State Erosion, Sediment, and Animal Waste Inventory of New Jersey. Of this total, 26,072 acres was in row crops, 2,628 acres in close-grown crops, 1,571 acres in pasture, and 1,170 acres in orchards.

Nearly all of the northern half of the county is in urban uses. Most of the woodland of the southern half of the county is on wet soils, and drainage of nearly all of these wet soils is difficult because of limited outlets. Much of the farmland is under absentee-ownership. Soybeans and grain are the common crops on the farms.

Erosion is a major concern on about one-fourth of the cropland and pasture in Middlesex County. If the slope is more than 2 percent, erosion is a hazard. Keyport, Lansdowne, Mattapex, Mount Lucas, Nixon Variant, Reaville, and Woodstown soils, for example, have slopes of 2 to 5 percent.

Loss of the surface layer through erosion is damaging for two reasons. First, productivity is reduced as the surface layer, which contains organic matter and nutrients, is lost and part of the subsoil is incorporated into the plow layer. Loss of surface layer is especially damaging to soils with a clayey subsoil, such as Keyport soils, and soils that are shallow to red shale bedrock, such as Klinesville soils. Erosion also reduces productivity on soils that tend to be droughty, such as Downer soils. Second, soil erosion on farmland results in sedimentation of streams. Control of erosion minimizes this form of stream pollution and improves the quality of water for municipal use, for recreation, and for fish and wildlife.

On many sloping fields, preparing a good seedbed and tilling are difficult on a clayey soil or a soil with a hardpan because the original friable surface layer has been eroded. Such spots are common in areas of Sassafras gravelly sandy loam.

Erosion-control practices provide protective surface cover, reduce runoff, and increase infiltration. A cropping system that keeps plant cover on the soil for extended periods can hold soil erosion losses to amounts that will

not reduce the productive capacity of the soils. On livestock farms, which require pasture and hay, the legume and grass forage crops in the cropping system reduce erosion on sloping land, provide nitrogen, and improve tilth for the following crop.

Contour tillage or terracing helps to reduce erosion on all farmed soils with slopes of more than 2 percent. If slopes are so short and irregular that contour tillage or terracing is not practical, cropping systems that provide substantial plant cover are needed. Terraces and diversions reduce the length of slope and reduce runoff and erosion. They are practical on deep, well drained soils that have smooth slopes. Sassafras and Matapeake, for example, are suitable for terraces.

Contouring and contour stripcropping are erosion-control practices in the survey area. They are best suited to soils with smooth, uniform slopes, including most of the sloping Downer, Hammonton, Matapeake, Mattapex, Mount Lucas, Nixon, Penn, Reaville, Sassafras, and Woodstown soils.

Soil blowing is a hazard on the sandy Downer and Fort Mott soils and the mucky Manahawkin soils. Maintaining a plant cover and using windbreaks are effective in reducing wind erosion.

Planting a cover of small grain on fields after summer or fall crops are harvested also helps control erosion. The small grain grows a few inches and protects the soil in the winter to help reduce water and wind erosion. In spring this cover crop is plowed under or used as a mulch for conservation tillage, and as it decomposes, its nutrients become available to the new crop.

Drainage is the major management need on about two-thirds of the acreage used for crops and pasture in the survey area. Some soils are naturally so wet that the production of crops common to the area is generally not possible. An example of this is very poorly drained Mullica soils. Unless drainage is used, crops growing on moderately well drained soils are damaged during most years. In this category are the Chalfont, Lansdowne, Mattapex, Mount Lucas, Nixon Variant, Pemberton, Reaville, and Woodstown soils.

The design of surface and subsurface drainage systems varies with the kind of soil. A combination of surface drainage and tile drainage is needed in most areas of poorly drained and very poorly drained soils used intensively for row crops. Drains have to be more closely spaced in soils with slow permeability than in the more permeable soils. Tile drainage is very slow in Elkton soils. Establishing adequate outlets for tile drainage systems is difficult in many areas of Fallsington soils.

Fertility is naturally low in the soils of this county, especially on the Coastal Plain. All the soils were water deposited, and many of the nutrients necessary for plant growth were dissolved and leached from the soil. The high rainfall of the area has also contributed to leaching of nutrients. Periodic applications of lime and fertilizer are necessary if the soils are to achieve maximum productivity. On all soils, additions of lime and fertilizer should be based on the characteristics of the soil, the results of soil tests, the need of the crop, and the expected level of yields.

Tilth is an important factor in the germination of seeds and in the infiltration of water. Soils with good tilth are granular and porous.

Most of the soils used for crops in the survey area have a surface layer of loam or silt loam that is light colored and low in organic matter content. Generally, the structure of such soils is weak, and intense rainfall causes the formation of a crust on the surface. The crust is hard when dry, and reduces infiltration and increases runoff. Regular additions of crop residue, manure, and other organic material can help to improve soil structure and reduce crust formation. For example, plowing under of winter cover crops incorporates organic matter into the soil and is helpful in maintaining tilth and reducing crusting.

Field crops suited to the soils and climate of the survey area include many that are not commonly grown. Corn and, to an increasing extent, soybeans, are the row crops. Wheat and barley are the common close-growing crops.

Special crops grown commercially in the survey areas are vegetables (such as spinach, snapbeans, and cabbage), small fruits, tree fruits (such as apples and peaches), and nursery plants.

Plant nurseries are throughout Middlesex County. For many years the Borough of Middlesex has grown flowers, principally cut flowers, for the nearby metropolitan markets. Several small farms in South Plainfield grow flowers as plants for the fresh market. Several apple farms in the county provide a roadside market.

Deep soils that have good natural drainage and that warm up early in spring are especially well suited to many vegetables and small fruits. The soils with those characteristics in this survey area are Sassafras, Matapeake, Nixon, and Penn soils on slopes of less than 5 percent. Also, if irrigated, the Downer, Fort Mott, and Tinton loamy sands that have slopes of less than 5 percent are well suited to vegetables and small fruits. Crops generally can be planted and harvested earlier on all these soils than on the other soils in the survey area.

Most of the well drained soils in the survey area are suitable for orchards and nursery plants. Soils in low positions, where frost is frequent and air drainage is poor, are poorly suited to early-season vegetables, small fruits, and orchards.

Yields Per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be

higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification of each map unit also is shown in the table.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown, that good quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland or for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit (*5*). Only class and subclass are used in this survey. The levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, woodland, wildlife habitat, or recreation.

Capability units are soil groups within a subclass. The soils in a capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-4 or IIIe-6.

The acreage of soils in each capability class and subclass is shown in table 6. The capability classification of each map unit is given in the section "Detailed Soil Map Units" and in the yields table.

Woodland Management and Productivity

Table 7 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed in the tables. The table gives the ordination symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity (fig. 10).

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for an indicator tree species. The number indicates the volume, in cubic meters per hectare per year, that the indicator species can produce. The larger the number, the greater the potential productivity. The number 1 indicates low productivity; 2 and 3, moderate; 4 and 5, moderately high; 6 through 8, high; 9 through 11, very high; and 12 or more, extremely high. The second part of the symbol, a letter, indicates the major kind of soil limitation for use and management. The letter *R* indicates steep slopes; *X*, stones or rocks on the surface; *W*, excessive water in or on the soil; *T*, excessive alkalinity, acidity, sodium salts, or other toxic substances in the soil; *D*, restricted rooting depth caused by bedrock, hardpan, or other restrictive layer; *C*, clay in the upper part of the soil; *S*, sandy texture; and *F*, high content of rock fragments in the soil profile. The letter *A* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: R,X,W,T,D,C,S, and F.

Figure 10.—Sweetgum trees on soils in woodland suitability group 2w.

In table 7, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Erosion hazard is the probability that erosion can occur as a result of site preparation or following cutting operations and where the soil is exposed, for example, roads, skid trails, fire lanes, and log handling areas. Forests that are abused by fire or overgrazing are also subject to erosion. The ratings for the erosion hazard are based on the percent of the slope and on the erosion factor K shown in table 15. A rating of *slight* indicates that no particular measures to prevent erosion are needed under ordinary conditions. A rating of *moderate* indicates that erosion control measures are needed in certain silvicultural activities. A rating of *severe* indicates that special precautions are needed to control erosion in most silvicultural activities.

The proper construction and maintenance of roads, trails, landings, and fire lanes will help overcome the erosion hazard.

Equipment limitation reflects the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. The chief characteristics and conditions considered in the ratings are slope, stones on the surface, rock outcrops, soil wetness, and texture of the surface layer. A rating of *slight* indicates that equipment use normally is not restricted either in kind of equipment that can be used or time of year because of soil factors. If soil wetness is a factor, equipment use can be restricted for a period not to exceed 2 months. A rating of *moderate* indicates that equipment use is moderately restricted because of one or more soil factors. If soil wetness is a factor, equipment use is restricted for 2 to 6 months. A rating of *severe* indicates that equipment use is severely restricted either in kind of equipment or season of use. If soil wetness is a factor, equipment use is restricted for more than 6 months.

Choosing the most suitable equipment and timing harvesting and other management operations to avoid seasonal limitations help overcome the equipment limitation.

Seedling mortality refers to the probability of death of naturally occuring or planted tree seedlings as influenced by kinds of soil or topographic conditions. The factors considered in rating the soils for seedling mortality are texture of the surface layer, depth and duration of the water table, rock fragments in the surface layer, rooting depth, and aspect of the slope. A rating of *slight* indicates that under usual conditions the expected

mortality is less than 25 percent. A rating of *moderate* indicates that the expected mortality is 25 to 50 percent. Extra precautions are advisable. A rating of *severe* indicates that the expected mortality is more than 50 percent. Extra precautions are important. Replanting may be necessary.

The use of special planting stock and special site preparation, such as bedding, furrowing, or surface drainage, can help reduce seedling mortality.

Windthrow hazard is the likelihood of trees being uprooted (tipped over) by the wind because the soil is not deep enough for adequate root anchorage. The main restrictions are a seasonal high water table and bedrock or a fragipan or other limiting layer. A rating of *slight* indicates that normally no trees are blown down by the wind. Strong winds may break trees but do not uproot them. A rating of *moderate* indicates that moderate or strong winds occasionally blow down a few trees during periods of soil wetness. A rating of *severe* indicates that moderate or strong winds may blow down many trees during periods of soil wetness.

The use of specialized equipment that does not damage surficial root systems during partial cutting operations can help reduce windthrow. Care in thinning or no thinning also can help reduce windthrow.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Common trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

The *productivity class*, a number, represents an expected volume produced by the most important trees. This number, expressed as cubic meters per hectare per year, indicates the amount of fiber produced on a fully stocked, even-aged, unmanaged stand. One cubic meter per hectare equals 14.3 cubic feet per acre.

The first tree species listed under common trees for a soil is the indicator species for that soil. The indicator species is the species that is common in the area and is generally the most productive on the soil. The productivity class of the indicator species is the number used for the ordination symbol.

Trees to plant are those that are suited to the soil and are planted for commercial wood production.

Recreation

The soils of the survey area are rated in table 8 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 8, the degree of soil limitation is expressed as slight, moderate, or severe.

Slight means that soil properties are generally favorable and that limitations are minor and easily overcome.

Moderate means that limitations can be overcome or alleviated by planning, design, or special maintenance.

Severe means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 8 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 11 and interpretations for dwellings without basements and for local roads and streets in table 10.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during

the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 9, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat (*1*).

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, timothy, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, asters, ragweed, and chicory.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are oak, birch, cherry, maple, apple, hawthorn, dogwood, hickory, blackberry, and blueberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are gray dogwood, autumn-olive, and crabapple.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, hemlock, cedar, and juniper.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, wildrice, cattail, cordgrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, swamps, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include weasel, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon and deer.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 10 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site

features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost-action potential, and depth to a high water table affect the traffic-supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 11 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 11 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 11 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on

the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 11 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 12 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 12, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 13 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for embankments, dikes, and levees and for aquifer-fed excavated ponds. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

Table 14 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture (*4*). These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*3*) and the system adopted by the American Association of State Highway and Transportation Officials (*2*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The

estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 15 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the

susceptibility of soil to wind erosion and the amount of soil lost. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.
2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.
3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.
5. Loamy soils that are less than 20 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible. Crops can be grown if measures to control wind erosion are used.
6. Loamy soils that are 20 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. Crops can easily be grown.
7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can easily be grown.
8. Stony or gravelly soils and other soils not subject to wind erosion.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 15, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 16 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

Some soils in table 16 that are less than 20 inches deep to bedrock are assigned to two hydrologic soil groups. The first letter applies to areas where the bedrock is cracked and pervious and the second letter to areas where the bedrock is impervious or where exposed bedrock makes up more than 25 percent of the surface of the soil.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary covering of the soil surface by flowing water, is caused by overflowing streams, by runoff from adjacent slopes, or by inflow from high tides. Shallow water standing or flowing for short periods after rainfall or snowmelt is not considered flooding. Standing water in swamps and marshes or in a closed depression is considered ponding.

Table 16 gives the frequency and duration of flooding and the time of year when flooding is most likely to occur.

Frequency, duration, and probable period of occurrence are estimated. Frequency generally is expressed as *none, rare, occasional, common,* or *frequent. None* means that flooding is not probable. *Rare* means that flooding is unlikely but possible under unusual weather conditions (there is a near 0 to 5 percent chance of flooding in any year). *Occasional* means that flooding occurs infrequently under normal weather conditions (there is a 5 to 50 percent chance of flooding in any year). *Frequent* means that flooding

occurs often under normal weather conditions (there is more than a 50 percent chance of flooding in any year). *Common* is used when classification as occasional or frequent does not affect interpretations. Duration is expressed as *very brief* (less than 2 days), *brief* (2 to 7 days), *long* (7 days to 1 month), and *very long* (more than 1 month). The time of year that floods are most likely to occur is expressed in months. November-May, for example, means that flooding can occur during the period November through May. About two-thirds to three-fourths of all flooding occurs during the stated period.

The information on flooding is based on evidence in the soil profile, namely, thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons, which are characteristic of soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely, grayish colors or mottles in the soil. Indicated in table 16 are the depth to the seasonal high water table; the kind of water table, that is, *perched, artesian,* or *apparent;* and the months of the year that the water table commonly is highest. A water table that is seasonally high for less than 1 month is not indicated in table 16.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. An *artesian* water table is under hydrostatic head, generally below an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

The two numbers in the "High water table-Depth" column indicate the normal range in depth to a saturated zone. Depth is given to the nearest half foot. The first numeral in the range indicates the highest water level. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. "More than 6.0" indicates that the water table is below a depth of 6 feet or that the water table exists for less than a month.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*6*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 17 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Ultisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Udult (*Ud*, meaning humid, plus *ult*, from Ultisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Hapludults (*Hapl*, meaning minimal horizonation, plus *udults*, the suborder of the Ultisols that have a udic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Hapludults.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is coarse-loamy, mixed, mesic Typic Hapludults.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the *Soil Survey Manual* (*4*). Many of the technical terms used in the descriptions are defined in *Soil Taxonomy* (*6*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Atsion Series

The Atsion series consists of deep, poorly drained soils. They formed in acid, sandy Coastal Plain sediments and are in low positions on the landscape. Slope ranges from 0 to 2 percent but is dominantly less than 1 percent.

Atsion soils are on the landscape with Klej, Manahawkin, Lakehurst, and Hammonton soils. The Atsion soils do not have the 16 inches of organic matter common to the Manahawkin soils or the yellowish brown B horizon common to the Lakehurst and Hammonton soils.

Typical pedon of Atsion sand, 0.3 mile west of Johnas Middle School on West Greystone Road, in Old Bridge Township:

O1—2 inches to 1 inch, loose leaves and twigs.
O2—1 inch to 0, black (10YR 2/1) peat; partially decomposed leaves and twigs; many fine roots; clear wavy boundary.
A1—0 to 4 inches, black (10YR 2/1) sand; single grain; loose; common fine roots; extremely acid; clear irregular boundary.
A2—4 to 16 inches, gray (10YR 6/1) sand; single grain; loose; common roots; very strongly acid; clear wavy boundary.
Bh—16 to 22 inches, dark brown (7.5YR 3/2) loamy sand; massive; firm in place, friable when removed; many medium roots; very strongly acid; clear irregular boundary.
B3—22 to 36 inches, brown (10YR 4/3) sand; single grain; loose; few roots; very strongly acid; gradual wavy boundary.
C—36 to 60 inches, brown (10YR 5/3) sand; single grain; loose; very strongly acid.

The solum thickness ranges from 20 to 40 inches. The content of rounded quartzose gravel ranges from 0 to 5 percent in the solum and 0 to 20 percent in the C horizon. Reaction in unlimed areas ranges from extremely acid to very strongly acid.

The A1 horizon has hue of 2.5Y and 10YR, value of 2 or 3, and chroma of 0 or 1. The horizon is 4 to 6 inches thick. The A2 horizon has hue of 2.5Y to 5YR, value of 5 to 7, and chroma of 1 or 2.

The Bh horizon has hue of 7.5YR to 5YR, value of 2 or 3, and chroma of 2 or 3. It is mostly loose but ranges to extremely firm. The soil generally is more firm when it is drained. The horizon is dark dominantly because of organic matter but contains iron in places. It is sand or loamy sand.

The C horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 to 3. The C horizon mainly is sand, but in places it ranges to sandy loam or sandy clay loam.

Boonton Series

The Boonton series consists of deep, well and moderately well drained soils. They formed in medium-textured, acid glacial till. The Boonton soils are on rolling hilltops and side slopes. Slope ranges from 0 to 15 percent.

Boonton soils are on the landscape with Dunellen, Ellington, and Haledon soils. The Boonton soils have a fragipan, which neither the Dunellen nor Ellington soils have. The Boonton soils do not have a seasonal high water table or low-chroma mottles in the B horizon, both of which are typical of the Haledon soils.

Typical pedon of Boonton loam, 2 to 5 percent slopes, at the edge of an excavation on the west side of Woodland Avenue, 100 yards north of Country Land, in Edison Township:

Ap—0 to 10 inches, dark brown (7.5YR 4/2) loam; moderate fine to medium granular structure; very friable; many fine and medium roots; 2 to 5 percent coarse fragments; strongly acid; abrupt smooth boundary.
B1t—10 to 20 inches, yellowish red (5YR 4/6) loam; weak medium granular structure; slightly firm; common fine and medium roots; 2 to 5 percent coarse fragments; many thin clay films; strongly acid; gradual wavy boundary.
B2t—20 to 33 inches, dark reddish brown (2.5YR 3/4) loam; moderate medium subangular blocky structure; firm; few fine roots; 2 to 5 percent coarse fragments; many thin to moderately thick clay films; strongly acid; gradual irregular boundary.
Bx—33 to 40 inches, dark reddish brown (2.5YR 3/4) sandy loam; medium subangular blocky structure; very firm, dense and brittle; 2 percent coarse fragments; strongly acid; diffuse wavy boundary.
C—40 to 60 inches, dark reddish brown (2.5YR 3/4) sandy loam; massive; firm; 2 percent coarse fragments; strongly acid.

The solum thickness ranges from 40 to 60 inches. The content of coarse fragments ranges from 2 to 5 percent in the solum and 2 to 25 percent in the C horizon. The rock fragments generally are well graded, ranging in size from fine gravel to large boulders. These coarse fragments are mostly red shale, red sandstone, diabase, basalt, and granite. Reaction in unlimed areas ranges from strongly acid to very strongly acid.

The Ap horizon has hue of 7.5YR, value of 3 to 6, and chroma of 2 to 4.

The B horizon has hue of 5YR or 2.5YR, value of 3 or 4, and chroma of 4 to 6. It has high-chroma mottles in some pedons. It has subangular blocky structure, or the horizon is massive. The B horizon ranges from fine sandy loam to silt loam.

The C horizon has hue of 2.5YR or 5YR, value of 3 or 4, and chroma of 4 to 6. It is sandy loam or loam.

Chalfont Series

The Chalfont series consists of deep, somewhat poorly drained soils. They formed in a silty mantle over material weathered from metamorphosed shale and argillite bedrock. The Chalfont soils are on uplands near Heathcote Brook. Slope ranges from 0 to 5 percent.

Chalfont soils are on the landscape with Fallsington, Reaville Variant, and Mount Lucas soils and Humaquepts. The low-chroma mottles in the Chalfont soils are at a shallower depth than those in the Mount Lucas soils. The Chalfont soils have a well developed fragipan; the Fallsington and Mount Lucas soils and

Humaquepts do not have a fragipan. The Chalfont soils are better drained than the Reaville Variant soils. The Chalfont soils have a well developed profile and are not subject to flooding; Humaquepts are poorly developed and are subject to flooding.

Typical pedon of Chalfont silt loam, 2 to 5 percent slopes, 50 feet east of U.S. Route 1 and 200 feet south of Stout's Lane, in South Brunswick Township:

Ap—0 to 6 inches, dark grayish brown (10YR 4/2) silt loam; moderate fine and medium granular structure; friable; many fine roots; strongly acid; clear irregular boundary.

B21t—6 to 12 inches, yellowish brown (10YR 5/6) silty clay loam; common fine distinct light gray (10YR 7/2) mottles; moderate fine and medium subangular blocky structure; friable; common medium roots; few thin clay films on ped faces; strongly acid; clear irregular boundary.

B22t—12 to 20 inches, yellowish brown (10YR 5/6) silty clay loam; few fine distinct light gray (10YR 7/2) mottles; strong fine and medium subangular blocky structure; friable; few fine roots; few thin clay films on ped faces; strongly acid; clear irregular boundary.

B23t—20 to 26 inches, yellowish brown (10YR 5/6) silty clay loam; common fine and medium faint yellowish brown (10YR 5/4) mottles; strong fine and medium subangular blocky structure; very firm; few fine roots; few thin clay films on ped faces; medium acid; abrupt smooth boundary.

Bx—26 to 50 inches, yellowish brown (10YR 5/6) silty clay loam; common fine and medium distinct light brownish gray (10YR 6/2) and brown (7.5YR 5/2) mottles; weak coarse prismatic structure parting to medium subangular blocky; very firm, brittle; 2 percent gray shale fragments; slightly acid; abrupt smooth boundary.

C—50 to 60 inches, olive brown (2.5YR 4/4) silty clay loam; massive; very firm; 5 percent gray shale fragments; neutral.

The solum thickness ranges from 40 to 60 inches. The content of coarse fragments in the upper part of the solum ranges from 0 to 5 percent. It ranges from 2 to 15 percent in the lower part of the subsoil and in the C horizon. The fragments are burned shale, silica, trap rock, and argillite. Reaction ranges from slightly acid to neutral.

The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3.

The B horizon has hue of 10YR, value of 4 or 5, and chroma of 4 to 6. The B horizon is silty clay loam or silt loam. The depth to the fragipan ranges from 15 to 30 inches. The fragipan generally is well developed, and consistence rarely exceeds very firm.

The C horizon has hue of 10YR or 2.5YR value of 4 or 5, and chroma of 3 to 5. It is silty clay loam, silt loam, or gravelly silt loam.

Downer Series

The Downer series consists of deep, well drained soils. They formed in acid, moderately coarse textured Coastal Plain sediments. Downer soils are on divides, terraces, side slopes, and toe slopes. Slope ranges from 0 to 15 percent.

Downer soils are on the landscape with Hammonton, Evesboro, Fort Mott, Klej, and Sassafras soils. The Downer soils have neither the mottled B horizon typical of the Klej soils nor the moderately fine textured B horizon typical of the Sassafras soil. The Downer soils have more clay in the B horizon than the Evesboro or Klej soils and do not have the thick A horizon typical of the Fort Mott soils.

Typical pedon of Downer loamy sand, 0 to 5 percent slopes, in a wooded area 100 yards southwest of Robert Frost School, Frost Avenue, East Brunswick Township:

O1—4 to 2 inches, loose oak leaves, twigs, and small amounts of blueberry leaves.

O2—2 inches to 0, dark brown (10YR 3/3) peat of partially decomposed oak and blueberry leaves and twigs; many fine roots.

A1—0 to 2 inches, very dark brown (10YR 2/2) loamy sand; weak fine granular structure; friable; many fine roots; very strongly acid; abrupt smooth boundary.

A2—2 to 13 inches, strong brown (7.5YR 5/6) loamy sand; single grain; loose; common fine roots; very strongly acid; gradual smooth boundary.

Bt—13 to 30 inches, strong brown (7.5YR 5/6) sandy loam; moderate fine and medium subangular blocky structure; friable; few fine and medium roots; sand grains bridged with clay; 2 percnt quartz pebbles; very strongly acid; gradual smooth boundary.

C—30 to 60 inches, strong brown (7.5YR 5/6) loamy sand; single grain; friable; few roots; 5 percent quartz pebbles; very strongly acid.

The solum thickness ranges from 20 to 36 inches. The content of rounded quartzose pebbles ranges from 0 to 15 percent in the solum and 0 to 30 percent in some parts of the C horizon. Reaction in unlimed areas ranges from strongly acid to extremely acid.

The A1 horizon has hue of 10YR, value of 2 or 3, and chroma of 1 to 3. The A2 horizon has hue of 10YR or 7.5YR, value of 5, and chroma of 3 to 6. The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3.

The B horizon has hue of 7.5YR or 10YR, value of 5, and chroma of 6 to 8. It mainly is sandy loam but is sandy clay loam in thin horizons.

The C horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 6 to 8. It is dominantly sand or loamy sand but in some profiles is sandy loam to sandy clay loam at a depth of more than 40 inches.

Dunellen Series

The Dunellen series consists of deep, well drained soils. They formed in acid, moderately coarse textured glacial outwash material. The Dunellen soils are on the glacial outwash terraces near Greenbrook. Slope ranges from 0 to 5 percent.

Dunellen soils are on the landscape with Ellington, Ellington Variant, Reaville, Boonton, and Rowland soils. The Dunellen soils do not have the mottles that are common to the Ellington and Ellington Variant soils or the fragipan that is common to the Boonton soils, contain less clay than the Reaville or Rowland soils, and are deeper to bedrock than the Reaville soils. The Dunellen soils are not flooded; the Rowland soils are flooded at least once a year.

Typical pedon of Dunellen sandy loam, in an area of Dunellen-Urban land complex, 0 to 5 percent slopes, in a field at the intersection of Mountain Avenue and Legion Place, in Middlesex Borough:

A1—0 to 1/2 inch, very dark brown (10YR 2/2) sandy loam; moderate fine and medium granular structure; friable; many fine roots; strongly acid; abrupt irregular boundary.

A2—1/2 to 14 inches, dark brown (7.5YR 4/4) sandy loam; weak fine and medium granular structure; friable; many fine and medium roots; strongly acid; gradual wavy boundary.

B21t—14 to 22 inches, dark brown (7.5YR 4/4) sandy loam; moderate medium subangular blocky structure; friable; common medium roots; weak clay bridging between sand grains; strongly acid; gradual wavy boundary.

B22t—22 to 32 inches; reddish brown (5YR 4/4) sandy loam; moderate medium subangular blocky structure; friable; common medium roots; weak clay films on ped surfaces and bridging of individual grains; strongly acid; gradual wavy boundary.

B3—32 to 40 inches; reddish brown (5YR 4/4) sandy loam; weak medium subangular blocky structure; friable; few fine and medium roots; strongly acid; gradual wavy boundary.

C1—40 to 50 inches, dark brown (7.5YR 4/4) sandy loam; massive; friable; few fine and medium roots; strongly acid; gradual wavy boundary.

C2—50 to 60 inches, dark brown (7.5YR 4/4) loamy sand; single grain; loose; 5 percent pebbles; strongly acid.

The solum thickness ranges from 25 to 40 inches. The depth to red shale bedrock is more than 6 feet. Coarse fragments, dominantly gravel and shale material, make up 0 to 25 percent of the solum and 0 to 50 percent of the C horizon. Reaction in unlimed areas is strongly acid or very strongly acid.

The A1 horizon has hue of 10YR, value of 2 or 3, and chroma of 2 or 3. The A2 horizon has hue of 7.5YR or 5YR, value of 3 or 4, chroma of 3 or 4.

The B horizon has hue of 7.5YR or 5YR, value of 3 or 4, and chroma of 3 or 4. Consistence is very friable or friable. The B horizon is sandy loam or its gravelly analog.

The C horizon has hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 3 or 4. It mainly is sandy loam or loamy sand in the fine earth fraction. Thin strata of material finer than sandy loam are in some pedons.

Dunellen Variant

The Dunellen Variant consists of deep, moderately well drained soils. They form in acid, moderately coarse textured glacial outwash. Dunellen Variant soils are on the glacial outwash terrace near Greenbrook and Bound Brook in Piscataway Township and Lake Carnegie. Slope ranges from 0 to 5 percent.

Dunellen Variant soils are on the landscape with Dunellen, Ellington Variant, Reaville, and Boonton soils and Humaquepts, frequently flooded. Dunellen Variant soils have mottles in the subsoil; the Dunellen and Boonton soils are not mottled. The Dunellen Variant soils do not have the red shale bedrock common to the Ellington Variant and Reaville soils. The Dunellen Variant soils are not flooded; the Humaquepts are frequently flooded.

Typical pedon of Dunellen Variant sandy loam, 0 to 2 percent slopes, in a wooded area at New Brunswick Avenue and Rutgers Road, 300 feet east of New Brunswick Avenue:

O2—2 inches to 0, black (10YR 2/1) muck; weak fine granular structure; very friable; many fine and medium roots; strongly acid; abrupt smooth boundary.

A1—0 to 4 inches, brown (7.5YR 4/2) sandy loam; weak fine granular structure; very friable; many fine and medium roots; strongly acid; clear wavy boundary.

A2—4 to 11 inches, pale brown (10YR 6/3) sandy loam; common medium distinct strong brown (7.5YR 5/6) mottles; weak fine granular structure; very friable; common fine roots; strongly acid; gradual wavy boundary.

B1—11 to 17 inches, brown (7.5YR 5/4) sandy loam; common medium faint strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; very friable; few fine roots; strongly acid; gradual wavy boundary.

B2t—17 to 25 inches, reddish brown (5YR 4/3) sandy loam; coarse platy structure; very friable; few fine roots; few clay bridges; strongly acid; gradual smooth boundary.

IIC1—25 to 40 inches, reddish brown (5YR 4/3) stratified sandy loam and gravelly sandy loam; massive; very friable; few fine roots; thin gray (2.5YR 6/0) finer textured strata; gradual wavy boundary.

IIC2—40 to 60 inches, reddish brown (5YR 4/3) stratified sandy loam, gravelly sandy loam, and loam; massive; very friable; firm; strongly acid.

The solum thickness ranges from 18 to 30 inches. Coarse fragments make up 0 to 25 percent of the solum and 0 to 35 percent of the C horizon. Reaction in unlimed areas ranges from extremely acid to strongly acid.

The A horizon has hue of 7.5YR, value of 2 to 4, and chroma of 2 or 4.

The B horizon has hue of 5YR to 7.5YR, value of 4 or 5, and chroma of 3 to 8. It ranges from loam to sandy loam. It has a subangular blocky structure or platy structure or is massive.

The C horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 3 to 8. It is stratified fine sand, sandy loam, gravelly loamy sand, or gravelly sand.

Elkton Series

The Elkton series consists of deep, poorly drained soils. They formed in acid, moderately fine textured Coastal Plain sediments. The Elkton soils are on broad, low-lying flats, basins, and drainageways. Slope ranges from 0 to 2 percent.

Elkton soils are on the landscape with Keyport, Woodstown, and Manahawkin soils and Humaquepts. The Elkton soils contain more clay than the Woodstown or Manahawkin soils or Humaquepts and do not have the high organic content common to the Manahawkin soils. The Elkton soils have a gray Bt horizon; the Bt horizon in the Keyport soils is brownish.

Typical pedon of Elkton loam, 0 to 2 percent slopes, 200 feet north of Texas Road, 1,800 feet east of Englishtown Road, in Old Bridge Township:

Ap—0 to 8 inches, grayish brown (10YR 5/2) loam; common fine distinct dark yellowish brown (10YR 4/4) mottles; moderate fine granular structure; friable; common fine roots; very strongly acid; abrupt smooth boundary.

B2tg—8 to 35 inches, gray (10YR 5/1) clay loam; common to many fine distinct yellowish brown (10YR 5/6) mottles; strong medium subangular blocky or blocky structure; firm; few fine roots; continuous moderately thick clay films; very strongly acid; clear wavy boundary.

C—35 to 60 inches, gray (10YR 5/1) clay loam; common to many fine distinct yellowish brown (10YR 5/6) and dark yellowish brown (10YR 4/4) mottles; massive; firm; few roots; very strongly acid.

The solum thickness ranges from 30 to 40 inches. The content of rounded quartzose pebbles ranges from 0 to 5 percent. The reaction in unlimed areas ranges from strongly to extremely acid.

The Ap horizon has hue of 10YR, value of 4 to 6, and chroma of 1 or 2.

The B horizon has hue of 10YR, value of 4 to 6, and chroma of 1. It ranges from silty clay to clay.

The C horizon has hue of 10YR or 2.5YR, value of 4 to 6, and chroma of 1 or 2. In most places it is clay loam, silty clay, or clay. In some pedons, a sandy IIC horizon is at a depth of more than 40 inches.

Ellington Variant

The Ellington Variant consists of moderately deep to shale, moderately well drained soils. They formed in acid, moderately coarse textured glacial outwash material. The Ellington Variant soils are on the glacial outwash terraces near Ambrose Brook and Bound Brook. Slope ranges from 0 to 5 percent.

Ellington soils are on the landscape with Dunellen, Dunellen Variant, Reaville, and Parsippany soils. The depth to red shale bedrock is 20 to 40 inches in the Ellington Variant soils and more than 40 inches in the Dunellen and Dunellen Variant soils. The Ellington Variant soils have less clay in the subsoil than the Reaville soils and do not have the gray surface layer or the fine texture typical of the Parsippany soils.

Typical pedon of Ellington Variant sandy loam, 0 to 2 percent slopes, 20 feet south of Grandview Avenue, 0.1 mile north of North Randolphville Road, in Piscataway Tonwship.

A1—0 to 4 inches, dark brown (7.5YR 3/2) sandy loam; moderate medium and coarse granular structure; very friable; common medium roots; strongly acid; abrupt smooth boundary.

A2—4 to 20 inches, strong brown (7.5YR 5/6) sandy loam; weak moderate granular structure; very friable; common fine roots; strongly acid; gradual wavy boundary.

B—20 to 36 inches, yellowish red (5YR 4/6) sandy loam; many coarse faint reddish brown (5YR 5/4) mottles; massive; firm; few fine roots; strongly acid; abrupt smooth boundary.

R—36 inches, dark reddish brown (2.5YR 3/4) shale; many distinct pinkish gray (5YR 6/2) mottles on the surface of the rock.

The solum thickness ranges from 20 to 40 inches. The content of coarse fragments above the shale bedrock ranges from 0 to 35 percent. The reaction in unlimed areas ranges from extremely acid to strongly acid.

The A1 horizon has hue of 10YR or 7.5YR, value of 2 or 3, and chroma of 2 or 3. The A2 horizon has hue of 5YR to 10YR, value of 4 or 5, and chroma of 4 to 6.

The B horizon has hue of 5YR, value of 4 or 5, and chroma of 3 to 6. It has weak, medium to coarse, subangular blocky structure, or it is massive.

Evesboro Series

The Evesboro series consists of deep, excessively drained soils that formed in acid, coarse textured Coastal Plain sediments containing small amounts of silt and clay. The soils are on uplands, sandy knolls, and terraces. Slope ranges from 0 to 15 percent.

Evesboro soils are on the landscape with Klej, Downer, Lakewood, and Lakehurst soils. The Evesboro soils do not have the mottling typical of the Klej soils, the bleached A2 horizon typical of the Lakewood and Lakehurst soils, or as much clay in the B horizon as the Downer soils.

Typical pedon of Evesboro sand, 0 to 5 percent slopes, in a wooded area 400 feet south of U.S. Route 18 and 200 feet east of Englishtown Road, in the community of Old Bridge:

A1—0 to 3 inches, very dark grayish brown (10YR 3/2) sand; single grain; loose; common roots; very strongly acid; clear irregular boundary.

B—3 to 40 inches, strong brown (7.5YR 5/6) sand; single grain; loose; sand grains coated; common roots; very strongly acid; clear irregular boundary.

C—40 to 60 inches, reddish yellow (7.5YR 6/6) sand; single grain; loose; very few roots; very strongly acid; clear smooth boundary.

The solum thickness ranges from 30 to 48 inches. The content of rounded quartzose pebbles up to 2 inches in diameter ranges from 0 to 5 percent in the solum and 0 to 20 percent in the C horizon.

The A horizon has hue of 10YR, value of 2 to 5, and chroma of 2.

The B horizon has hue of 7.5YR and 10YR, value of 5, and chroma of 4 to 6. It is sand or loamy sand.

The C horizon has hue of 7.5YR, value of 5 or 6, and chroma of 3 to 6. It is stratified sand or loamy sand or their gravelly analogs.

Fallsington Series

The Fallsington series consists of deep, poorly drained soils that formed in acid, moderately fine textured Coastal Plain sediments. The Fallsington soils are in low-lying flats and basins. Slope ranges from 0 to 2 percent.

Fallsington soils are on the landscape with Woodstown and Mullica soils. The Fallsington soils are grayer than the Woodstown soils and finer textured than the Mullica soils.

Typical profile of Fallsington loam, in woods 75 feet west of high power line, 0.5 mile southwest of U.S. Route 130, 0.8 mile south of the intersection of U.S. Route 130 and Deans Rhode Hall Road, South Brunswick Township:

O—3 inches to 0, dark brown (7.5YR 4/4) peat.

A1—0 to 4 inches, very dark gray (10YR 3/1) loam; moderate medium and coarse granular structure; friable; common fine and few coarse roots; strongly acid; abrupt smooth boundary.

B1tg—4 to 16 inches, gray (10YR 6/1) loam; many medium prominent strong brown (7.5YR 5/8) mottles; weak medium and coarse subangular blocky structure; firm; few fine roots; 3 percent quartz pebbles; continuous moderately thick clay films line interstitial pores; strongly acid; clear wavy boundary.

IIB22tg—16 to 27 inches, gray (10YR 6/1) sandy clay loam; many medium prominent strong brown (7.5YR 5/8) mottles; moderate medium subangular blocky structure; firm; few fine roots; 3 percent fine and medium quartz pebbles; many moderately thick clay films line interstitial pores; strongly acid; clear wavy boundary.

IIC1—27 to 42 inches, light yellowish brown (2.5Y 6/4) gravelly loamy sand; many large distinct yellowish brown (10YR 5/8) mottles; single grain; loose; 20 percent fine and medium quartz pebbles; stratified; strongly acid; abrupt smooth boundary.

IIIC2—42 to 60 inches, yellowish brown (10YR 5/8) loamy sand; common coarse distinct yellowish red (5YR 5/8) mottles; single grain; loose; 10 percent fine and medium quartz pebbles in strata; strongly acid; abrupt smooth boundary.

The solum thickness ranges from 24 to 38 inches. The content of rounded quartzose pebbles ranges from 0 to 5 percent in the solum and 0 to 25 percent in the C horizon. The reaction in unlimed areas ranges from extremely acid to strongly acid.

The A horizon has hue of 10YR to 5Y, value of 2 or 3, and chroma of 1 or 2. It is sandy loam or loam.

Some pedons have an A2 horizon that has hue of 10YR to 5Y, value of 4 to 6, and chroma of 1 to 3. It ranges from loam to sandy loam.

The B horizon has hue of 10YR to 5Y, value of 4 to 6, and chroma of 1 to 3. It ranges from sandy loam to sandy clay loam.

The C horizon has hue of 10YR to 5Y, value of 5 to 6, and chroma of 1 to 8. It mainly is stratified sand, loamy sand, or loam. Thin strata of gravel or sandy clay loam are in some pedons.

Fallsington Variant

The Fallsington Variant consists of deep, poorly drained soils that formed in acid, moderately fine textured Coastal Plain sediments. The Fallsington Variant soils are in low-lying flats and basins. Slope ranges from 0 to 2 percent but is dominantly less than 1 percent.

Fallsington Variant soils are on the landscape with Nixon and Nixon Variant soils but are grayer in the surface layer. Fallsington Variant soils resemble

Fallsington soils except for small amounts of red shale fragments and detroidal shale. Red shale bedrock underlies Fallsington Variant soils at a depth of more than 6 feet.

A typical profile of Fallsington Variant loam, 0 to 2 percent slopes, 100 feet west of Cory Drive and 100 feet south of Finnegans Lane, in South Brunswick Township:

A1—0 to 5 inches, gray (10YR 6/1) (dry) loam, common to many fine to coarse distinct dark gray (10YR 4/1) mottles; moderate fine platy structure; hard dry, firm moist; many fine medium roots; 1 percent medium quartz pebbles; strongly acid; gradual wavy boundary.

B2t—5 to 26 inches, gray (10YR 5/1) (dry) silt loam; many fine and coarse gray (10YR 6/1) mottles; weak coarse subangular blocky structure; hard dry, firm moist; common medium roots; 1 percent medium quartz pebbles; few clay films; very strongly acid; gradual wavy boundary.

IIB3—26 to 30 inches, weak red (2.5YR 5/2) sandy clay loam; common to many distinct yellowish brown (10YR 5/8) and dark gray (10YR 4/1) mottles; moderate medium subangular blocky structure; hard dry, firm moist; common medium roots; 1 percent medium quartz pebbles; very strongly acid; gradual wavy boundary.

IIC—30 to 60 inches, light brownish gray (10YR 6/3), yellowish brown (10YR 5/6), and dark gray sandy loam; thin strata or lenses of loamy sand, clay, or loam; massive; few fine roots; 3 percent medium quartz pebbles; extremely acid.

The solum thickness ranges from 24 to 30 inches. The content of coarse fragments ranges from 1 to 2 percent in the solum and 2 to 4 percent in the C horizon. They are predominantly quartzose pebbles, but some minor amounts are red shale. The fine earth fraction also contains red shale (detroidal). The reaction ranges from strongly acid to extremely acid.

The A horizon has hue of 10YR, 2.5Y, or 5Y; value of 4 to 6; and chroma of 1 or 2.

The B horizon has hue of 10YR, 2.5Y, or 5Y; value of 4 to 7; and chroma of 1. It has blocky, subangular blocky, prismatic structure or is massive. Consistence is firm to very firm. Coarse fragments are principally quartz pebbles.

The C horizon has hue of 10YR to 5Y, value of 5 or 6, and chroma of 3 or 4. It mainly is sandy loam, loamy sand, or sand or their gravelly analogs. Thin strata of finer textured material is in some pedons. Coarse fragments are principally stratified quartzose gravel.

Red shale bedrock underlies this soil at a depth of more than 60 inches.

Fort Mott Series

The Fort Mott series consists of deep, well drained soils that formed in acid Coastal Plain sediments. Fort Mott soils are on divides, terraces, and side slopes. Slope ranges from 0 to 5 percent.

Fort Mott soils are on the landscape with Downer, Evesboro, and Hammonton soils. The A horizon of the Fort Mott soils is thicker than that of the Downer or Hammonton soils. The Fort Mott soils have a Bt horizon; the Evesboro soils do not. The Fort Mott soils do not have the low-chroma mottles in the subsoil that are typical in the Hammonton soils.

Typical pedon of Fort Mott loamy sand, 0 to 5 percent slopes, in East Brunswick Township, 50 feet northwest of old Stage Road, 0.5 mile southwest of Crescent Avenue:

Ap—0 to 8 inches, dark grayish brown (10YR 4/2) loamy sand; single grain; loose; many fine roots; strongly acid; abrupt smooth boundary.

A2—8 to 25 inches, brownish yellow (10YR 6/6) sand; single grain; loose; common fine roots; very strongly acid; clear wavy boundary.

B2t—25 to 35 inches, brownish yellow (10YR 6/8) sandy loam; weak fine to medium subangular blocky structure; friable; few roots; sand grains bridged with clay; 2 percent coarse fragments; very strongly acid; broken boundary.

C—35 to 60 inches, very pale brown (10YR 7/4) sand; single grain; loose; very strongly acid.

The solum thickness ranges from 30 to 60 inches. Rounded quartzose pebbles or ironstone fragments are not common in the Ap and A2 horizons but make up 0 to 15 percent of the B and C horizons. The reaction in unlimed areas ranges from strongly acid to extremely acid.

The Ap horizon has hue of 10YR, value of 2 to 4, and chroma of 2. It is loamy sand or sand.

The A2 horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 3 to 6. It is loamy sand or sand.

The B horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 6 to 8. It ranges from sandy clay loam to sandy loam.

The C horizon has hue of 7.5YR or 10YR, value of 6 or 7, and chroma of 4 or 5. It is sand, loamy sand, or sandy loam and is stratified.

Haledon Series

The Haledon series consists of deep, somewhat poorly drained soils that formed in medium-textured, acid glacial till. Slope ranges from 0 to 5 percent.

Haledon soils are on the landscape with Boonton, Ellington, and Haledon Variant soils. The Boonton soils do not have a seasonal high water table, the Ellington

soils do not have a fragipan, and the Haledon Variant soils are gray in the surface and subsurface layers.

Typical pedon of Haledon silt loam, 0 to 2 percent slopes, 120 feet across New Dover Road from John Adams School, 1,600 feet northeast of Tingley Road, Edison Township:

O1—3 to 2 inches, loose leaves and twigs.
O2—2 inches to 0, dark reddish brown (5YR 2/2) highly decomposed organic residue; many fine medium and coarse roots; strong coarse granular structure; abrupt smooth boundary.
Ap1—0 to 2 inches, dark brown (7.5YR 4/2) silt loam; weak fine and medium subangular blocky structure; friable; many fine and coarse roots; 2 percent coarse fragments; all grains stained or coated with organic matter; strongly acid; abrupt smooth boundary.
Ap2—2 to 8 inches, dark brown (7.5YR 4/4) silt loam; weak fine subangular blocky structure; friable; many medium roots; 2 percent coarse fragments; grains stained or coated with organic matter; strongly acid; abrupt smooth boundary.
B1—8 to 14 inches, brown (7.5YR 5/4) silt loam; weak medium subangular blocky structure; friable; few medium faint high chroma mottles; common fine and medium roots; 2 percent coarse fragments; few thin ped faces; strongly acid; gradual wavy boundary.
B2t—14 to 24 inches, dark brown (7.5YR 4/4) silt loam or loam; many medium distinct strong brown (7.5YR 5/8) mottles on ped faces; moderate medium subangular blocky structure; friable, slightly plastic, slightly sticky; common fine roots; widely spaced (light gray) vertically oriented polygonal patterns that are pinkish gray (7.5YR 7/2) and light gray (5YR 7/1) between polygons; 2 percent coarse fragments; common moderately thick clay films on ped faces; strongly acid; clear wavy boundary.
Bx1—24 to 42 inches, reddish brown (2.5YR 4/4) sandy loam; weak coarse platy structure; firm, brittle, nonplastic; polygons 10 to 12 inches across; few roots between polygons; 5 percent coarse fragments; many thick clay films line pores; strongly acid; gradual wavy boundary.
Bx2—42 to 60 inches, reddish brown (2.5YR 4/4) sandy loam; massive; very firm when moist, brittle, nonplastic when wet; few polygons; 10 percent coarse fragments; few thick clay films line pores; strongly acid; gradual wavy boundary.
C—60 to 70 inches, reddish brown (2.5YR 4/4) gravelly sandy loam; massive; very friable; 15 percent coarse fragments; slightly acid.

The solum thickness ranges 40 to 60 inches. The content of coarse fragments ranges from 2 to 5 percent in the solum and from 15 to 25 percent in the C horizon. The rock fragments mainly are well graded, ranging in size from fine gravel to a few large boulders. These coarse fragments mostly are red shale, red sandstone, diabase, basalt, and granite. The reaction of the soil in unlimed areas ranges from strongly acid to slightly acid.

The Ap horizon has hue of 7.5YR, value of 3 to 6, and chroma of 2 to 4.

The B1 and B2 horizons have hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 3 to 6. The Bx horizon has hue of 2.5YR or 5.YR, value of 4 or 5, and chroma of 4 to 6. The B horizon has subangular blocky structure, or the horizon is massive. The fines fill the intersticies of the progressively coarser texture material, producing a panlike condition, particularly in the lower horizons. The B horizon ranges from silt loam to fine sandy loam or their gravelly analogs.

The C horizon has hue of 2.5YR or 5Y, value of 4 or 5, and chroma of 4 to 6. It is sandy loam or loam. The depth to bedrock is more than 5 feet.

Haledon Variant

The Haledon Variant consists of moderately deep, poorly drained soils that formed in medium-textured, acid glacial till. The Haledon Variant soils are mainly on recessional moraines in Carteret and Woodbridge Townships. Slope ranges from 0 to 2 percent.

Haledon Variant soils are on the landscape with Haledon, Ellington, and Parsippany Variant soils. The Haledon Variant soils have a fragipan, and the Ellington and Parsippany Variant soils do not. The Haledon Variant soils are grayer in the surface layer than the Haledon soils are.

Typical pedon of Haledon Variant silt loam, 0 to 2 percent slopes, 100 yards east of the New Jersey Turnpike and 100 yards north of ConRail railroad:

O2—3 inches to 0, black (2.5Y 2/0) peat; very strongly acid; abrupt smooth boundary.
A1—0 to 3 inches, very dark gray (10YR 3/1) silt loam; moderate fine and medium granular structure; friable; many fine roots; 2 to 4 percent coarse fragments; strongly acid; gradual wavy boundary.
A2—3 to 7 inches, grayish brown (10YR 5/2) silt loam; few to common fine yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; common fine and medium roots; 2 to 4 percent coarse fragments; strongly acid; gradual wavy boundary.
B1t—7 to 11 inches, grayish brown (10YR 5/2) loam; few to common fine yellowish brown (10YR 5/6) mottles; moderate fine and medium subangular blocky structure; friable; common fine and medium roots; 2 to 5 percent coarse fragments; thick clay films; strongly acid; gradual wavy boundary.
B2t—11 to 16 inches, yellowish brown (10YR 5/6) loam; many medium grayish brown (10YR 5/2) mottles and few fine to medium reddish brown (5YR 4/4) mottles; moderate medium subangular blocky

structure; friable; common fine and medium roots; 5 to 8 percent coarse fragments; many thin clay films; strongly acid; gradual wavy boundary.

Bx—16 to 22 inches, reddish brown (5YR 5/4) loam; common medium grayish brown (10YR 5/2) mottles along root channels; moderate medium subangular blocky structure; firm, brittle; medium acid; gradual wavy boundary.

C—22 to 60 inches, yellowish red (5YR 4/6) loam; massive; friable; medium acid.

The solum thickness ranges from 20 to 40 inches. The content of coarse fragments ranges from 5 to 10 percent in the A and B horizons and from 5 to 15 percent in the C horizon.

The A1 horizon has hue of 10YR, value of 3 to 5, and chroma of 0 or 1.

The A2 horizon has hue of 10YR to 2.5YR, value of 4 or 5, and chroma of 2 to 3.

The B horizon has hue of 10YR, value of 4 to 6, and chroma of 2 to 6. It is loam or silty clay loam.

The C horizon has hue of 2.5YR or 5YR, value of 4 or 5, and chroma of 4 to 6. It is loam or sandy loam.

Hammonton Series

The Hammonton series consists of deep, moderately well drained or somewhat poorly drained soils that formed in acid, moderately coarse textured Coastal Plain sediments. The Hammonton soils are on terraces. Slope ranges from 0 to 3 percent.

Hammonton soils are on the landscape with Downer, Fallsington, Sassafras, Woodstown, and Klej soils. The Hammonton soils are mottled, and the Downer and Sassafras soils are not. The Bt horizon in the Hammonton soils is not as gray or as clayey as that in the Fallsington and is more clayey than that in the Klej soils.

Typical profile of Hammonton loamy sand, 0 to 3 percent slopes, 50 feet south of the intersection of Avenue A and Old Forge Road, in Helmetta:

Ap—0 to 8 inches, brown (10YR 4/3) loamy sand; weak fine granular structure; very friable; many fine roots; very strongly acid; abrupt smooth boundary.

A2—8 to 18 inches, yellowish brown (10YR 5/6) loamy sand; single grain; very friable; common fine roots; very strongly acid; clear wavy boundary.

B2t—18 to 30 inches, yellowish brown (10YR 5/6) sandy loam; common medium distinct light gray (5Y 7/2) and brownish yellow (10YR 6/8) mottles; weak medium subangular blocky structure; friable; few roots; many thin clay bridges; very strongly acid; clear wavy boundary.

C1—30 to 35 inches, pale brown (10YR 6/3) loamy sand; many fine to medium prominent brownish yellow (10YR 6/6) and gray (10YR 6/1) mottles; massive; friable; few roots; stratified; very strongly acid; clear abrupt boundary.

C2—35 to 60 inches, gray (7.5YR 5/1) loamy sand; common to many fine to medium prominent strong brown (7.5YR 5/6) and pale olive (5Y 6/4) mottles; single grain; loose; very strongly acid.

The solum thickness ranges from 20 to 40 inches. The content of rounded quartzose pebbles ranges from 0 to 5 percent in the solum and from 0 to 20 percent in the C horizon. The reaction in unlimed areas is very strongly or extremely acid.

The Ap horizon has hue of 10YR, value of 3 to 5, and chroma of 2 to 4. It is loamy sand or sandy loam. The A2 horizon has hue of 10YR, value of 5, and chroma of 4 to 8.

The B horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 4 to 8. Mottling ranges from few to many, fine to coarse, and faint to prominent. Consistence is friable or firm.

In some pedons there is a B1 horizon or B3 horizon, or both, that is sandy loam or loamy sand.

The C horizon has hue of 2.5YR or 10YR, value of 5 or 6, and chroma of 1 to 6.

The C horizon dominantly is loamy sand or sand. In some pedons the lower part of the C horizon, generally below a depth of 40 inches, is sandy loam or sandy clay loam.

Holmdel Series

The Holmdel series consists of deep, moderately well drained and somewhat poorly drained soils. Slopes range from 0 to 2 percent.

Holmdel soils are on the landscape with Tinton, Pemberton, Shrewsbury, and Fallsington soils. The combined thickness of the Ap and A2 horizons in the Holmdel soils is less than that of those horizons in the Tinton or Pemberton soils. The Holmdel soils have a browner subsoil than the Shrewsbury or Fallsington soils.

Typical pedon of Holmdel fine sandy loam, 0 to 2 percent slopes, in Monroe Township, 1,025 feet north of State Highway 33 and 625 feet east of Perrineville Road:

Ap—0 to 10 inches, dark brown (10YR 4/3) fine sandy loam; weak fine and medium granular structure; friable; common fine roots; very strongly acid; abrupt smooth boundary.

A2—10 to 14 inches, yellowish brown (10YR 5/6) fine sandy loam; weak fine and medium subangular blocky structure; friable; common fine roots; very strongly acid; clear wavy boundary.

B1—14 to 18 inches, yellowish brown (10YR 5/6) fine sandy loam; moderate medium subangular blocky structure; friable; common fine and medium roots; 2 percent glauconite; very strongly acid; gradual wavy boundary.

B21t—18 to 24 inches, yellowish brown (10YR 5/6) fine sandy loam; weak fine faint pale brown (10YR 6/3) mottles; moderate medium subangular blocky structure; common fine and medium roots; weak clay bridging between sand grains; 3 percent glauconite; very strongly acid; gradual wavy boundary.

B22t—24 to 38 inches, yellowish brown (10YR 5/6) fine sandy loam; common fine distinct strong brown (7.5YR 5/6) and light olive gray (5Y 6/2) mottles; moderate medium subangular blocky structure; friable; sticky when wet; few medium roots; moderate clay bridging; 10 percent glauconite; very strongly acid; gradual wavy boundary.

B3—38 to 42 inches, dark yellowish brown (10YR 4/4) sandy loam; few fine distinct reddish brown (5YR 4/4) iron stains and concretions; moderate medium subangular blocky structure; friable; 7 percent glauconite; very strongly acid; abrupt smooth boundary.

IIC—42 to 60 inches, stratified greenish gray (5GY 6/2) and yellowish red (5YR 5/8) sandy clay loam; massive; friable; 5 percent coarse fragments; very strongly acid.

The solum thickness ranges from 30 to 45 inches. The content of coarse fragments ranges from 0 to 5 percent in the upper part of the solum and from 2 to 15 percent in the subsoil and C horizon. Glauconite makes up 5 to 10 percent of the subsoil. Reaction of the soil ranges from extremely acid to very strongly acid.

The Ap horizon has hue of 10YR or 7.5Y, value of 4 or 5, and chroma of 2 or 3. The Ap horizon is fine sandy loam, sandy loam, or loam.

The B horizon has hue of 10YR, 7.5YR, or 2.5Y; value of 4 or 5; and chroma of 4 to 8. Few to many, fine to coarse, faint to prominent, high- and low-chroma mottles are in the B horizon. The B horizon is fine sandy loam, sandy loam, sandy clay loam, or loam.

The C horizon has hue of 5YR to 5GY, value of 4 to 6, and chroma of 2 to 6. It is stratified sandy clay loam, sandy loam, or loamy sand.

Humaquepts

Humaquepts consist of somewhat poorly drained to very poorly drained soils on flood plains that are subject to flooding several times each year. The soils formed in stratified sandy or loamy sediments of fluvial origin. Slope ranges from 0 to 2 percent.

Because of the variability of these soils, a typical pedon is not given. The solum ranges from 24 to 48 inches in thickness. The soils are extremely acid to slightly acid. Pebbles make up 0 to 20 percent of some lower horizons.

The A horizon has hue of 5YR to 2.5Y, value of 2 or 3, and chroma of 1 to 3. It is sandy loam or silt loam. Organic matter content ranges from low to very high. The stratified layers range from 3 to 18 inches in thickness.

The B horizon mainly has hue of 5YR to 10YR, value of 3 to 5, and chroma of 1 to 6. In some profiles it has brown or dark reddish brown mottles. It ranges from loamy sand to silt loam and their gravelly analogs. Organic matter content ranges from low to very high. The stratified layers range mainly from 12 to 36 inches in thickness.

Keyport Series

The Keyport series consists of deep, moderately well drained soils. They formed in acid, moderately fine textured Coastal Plain sediments. The Keyport soils are on divides, terraces, side slopes, and toe slopes. Slope ranges from 0 to 15 percent.

Keyport soils are in the landscape with Woodstown, Elkton, and Sassafras soils. The Keyport soils have more clay in the subsoil than the Woodstown or Sassafras soils and do not have the gray Bt horizon common to the Elkton soils.

Typical pedon of Keyport loam, 0 to 2 percent slopes, in a cultivated field 50 yards south of Morganville Road, 1,000 feet east of the Cheesequake Volunteer Fire Company on Route 516 in Old Bridge Township:

Ap—0 to 8 inches, brown (10YR 4/3) loam; few fine faint brown (10YR 5/3) mottles and few fine prominent yellowish red (5YR 4/6) mottles; moderate medium granular structure; friable; many fine roots; very strongly acid; abrupt smooth boundary.

B21t—8 to 15 inches, yellowish brown (10YR 5/6) silty clay loam; moderate medium subangular blocky structure; firm; many fine roots; many moderately thick clay films; very strongly acid; gradual wavy boundary.

B22t—15 to 27 inches, brown (10YR 4/3) clay loam; common to many fine distinct light brownish gray (10YR 6/2) and strong brown (7.5YR 5/6) mottles; strong medium subangular blocky structure; firm; few fine roots; continuous moderately thick clay films on faces of peds; few 1/4 inch iron concretions; very strongly acid; gradual wavy boundary.

B23t—27 to 40 inches, brown (10YR 4/3) clay loam; common to many coarse prominent olive yellow (5Y 6/6) and strong brown (7.5YR 5/6) mottles; strong medium subangular blocky structure; firm; few fine roots; continuous moderately thick clay films on faces of peds; few iron concretions; very strongly acid; gradual wavy boundary.

C—40 to 60 inches, grayish brown (2.5Y 5/2) silty clay loam; common to many fine and coarse faint pale olive (5Y 6/3) mottles and common to many fine and coarse prominent strong brown (7.5YR 5/6) mottles; massive; firm; very strongly acid.

The solum thickness ranges from 40 to 60 inches. The content of rounded coarse quartzose pebbles ranges from 0 to 2 percent. Reaction in unlimed areas ranges from very strongly acid to extremely acid.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It is silt loam, sandy loam, or loam.

The B horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 6. It has subangular blocky or blocky structure. Consistence is firm or very firm. The B horizon is silty clay loam, clay loam, and clay.

The C horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 4.

Klej Series

The Klej series consists of deep, moderately well drained or somewhat poorly drained soils. They formed in acid, coarse-textured Coastal Plain sediments. The Klej soils are on terraces and toe slopes. Slope ranges from 0 to 5 percent but is dominantly less than 1 percent.

Klej soils are on the landscape with Evesboro, Hammonton, and Atsion soils. The Klej soils are mottled in the subsoil, and the Evesboro soils are not. The Klej soils contain less clay than the Hammonton soils and are not so gray in the subsoil as the Atsion soils.

Typical pedon of Klej loamy sand, 0 to 3 percent slopes, in a field in Helmetta, 50 feet north of Main Street and 50 feet east of 13th Street:

O—1 inch to 0, very dark brown (10YR 2/2) decayed leaf litter; many fine roots; abrupt smooth boundary.

Ap—0 to 6 inches, very dark grayish brown (10YR 3/2) loamy sand; weak medium subangular blocky structure; very friable; many fine roots; very strongly acid; abrupt smooth boundary.

B2—6 to 27 inches, yellowish brown (10YR 5/6) loamy sand; common medium distinct strong brown (7.5YR 5/8), yellowish brown (10YR 5/4), and light gray (10YR 7/2) mottles; weak medium subangular blocky structure; very friable; few fine roots; very strongly acid; clear gradual boundary.

B3—27 to 40 inches, yellowish brown (10YR 5/6) loamy sand; common medium distinct strong brown (7.5YR 5/8) and yellowish brown (10YR 5/4) mottles; single grain; loose; many common roots; very strongly acid; clear gradual boundary.

C—40 to 60 inches, yellowish brown (10YR 5/6) loamy sand; common large distinct light yellowish brown (10YR 6/4) and yellowish brown (10YR 5/8) mottles; single grain; loose; few fine roots; very strongly acid.

The solum thickness ranges from 25 to 50 inches. Rounded quartzose pebbles make up 0 to 5 percent of the solum and 0 to 15 percent of the C horizon.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 to 3.

The B horizon has hue of 10YR, value of 5, and chroma of 3 to 6. It mainly is loamy sand or sand. In some pedons the B horizon has strata of fine gravel.

The C horizon has hue of 2.5Y or 10YR, value of 5 or 6, and chroma of 4 to 8. It is sand or loamy sand above a depth of 40 inches and ranges mainly from sand to clay below a depth of 40 inches. In some pedons thin strata of gravelly sand are below a depth of 40 inches.

Klinesville Series

The Klinesville series consists of shallow, well drained soils. They formed in acid fractured shale bedrock. The Klinesville soils are on divides and side slopes. Slope ranges from 0 to 25 percent.

Klinesville soils are on the landscape with Reaville, Reaville Variant, Penn, Dunellen, and Ellington soils. The Klinesville soils are better drained than the Ellington, Reaville, or Reaville Variant soils and are shallower to bedrock than the Penn or Dunellen soils.

Typical pedon of Klinesville shaly loam, 0 to 5 percent slopes, in a field 50 feet south of Britt Road and 200 feet west of Metlar's Lane, on the campus of Rutgers University in Piscataway Township:

Ap—0 to 8 inches, dark reddish brown (5YR 3/4) shaly loam; moderate fine granular structure; friable; many fine and medium roots; 20 percent shale fragments; very strongly acid; abrupt smooth boundary.

B—8 to 12 inches, dark reddish brown (2.5YR 3/4) shaly silt loam; weak fine and medium subangular blocky structure; friable; many fine roots; 45 percent shale fragments; very strongly acid; gradual irregular boundary.

R—12 inches, dark reddish brown (2.5YR 3/4) weathered fractured bedrock.

The solum thickness and depth to bedrock range from 10 to 20 inches. Coarse fragments make up 15 to 50 percent of the solum and 50 to 75 percent of the C horizon. Reaction ranges from medium acid to very strongly acid.

The Ap horizon has hue of 5YR or 2.5YR, value of 3, and chroma of 3 or 4.

The B horizon has hue of 5YR or 2.5YR, value of 3, and chroma of 3 or 4.

Some pedons have a C horizon that is loosely bedded and partially weathered red shale. It contains cracks that are filled with weathered soil and alluvial clay.

The R horizon has hue of 5YR or 2.5YR, value of 3 to 5, and chroma of 3 to 6. It is jointed red shale and bedrock and is firm in place.

Lakehurst Series

The Lakehurst series consists of deep, moderately well drained or somewhat poorly drained soils that

formed in acid, coarse-textured Coastal Plain sediments. The Lakehurst soils are on divides and toe slopes. Slope ranges from 0 to 3 percent.

Lakehurst soils are on the landscape with Lakewood, Evesboro, Klej, and Atsion soils. The Lakehurst soils have a paler C horizon than the Lakewood soils and have mottling that is not common to Lakehurst soils, a thick bleached A2 horizon that is not common to the Evesboro and Klej soils, and a yellowish color in the subsoil that is not common to the Atsion soils.

Typical pedon of Lakehurst sand, 0 to 3 percent slopes, 25 feet south of Forge Road and 1.5 miles west of Pergola Avenue, Monroe Township:

A1—0 to 3 inches, black (10YR 2/1) sand; single grain; very friable; many fine roots; extremely acid; gradual wavy boundary.
A2—3 to 21 inches, light brownish gray (10YR 6/2) sand; single grain; loose; common medium roots; very strongly acid; gradual wavy boundary.
Bh—21 to 24 inches, yellowish red (5YR 4/6) sand; single grain; very friable; few 1/4 to 1 inch spherical nodules; common medium roots; very strongly acid; gradual broken boundary.
B3—24 to 40 inches, yellow (10YR 7/6) sand; common medium faint brownish yellow (10YR 6/6) mottles and common medium distinct light gray (10YR 7/2) mottles; single grain; loose; coated sand grains; few roots; very strongly acid; gradual wavy boundary.
C1—40 to 50 inches, light gray (10YR 7/2) sand; common medium and fine distinct brownish yellow (10YR 6/6) mottles; single grain; loose; very strongly acid; gradual broken boundary.
C2—50 to 60 inches, grayish brown (10YR 5/2) sand; common medium and large, faint light brownish gray (10YR 6/2) mottles; single grain; loose; very strongly acid.

The solum thickness ranges from 30 to 50 inches. The content of rounded quartzose pebbles ranges from 0 to 5 percent in the solum and from 0 to 15 percent in the C horizon. Reaction ranges from very strongly acid to extremely acid.

The A1 horizon has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 1 or 2. The A2 horizon has hue of 10YR, value of 6 or 7, and chroma of 1 or 2. The thickness of the A2 horizon ranges from 7 to 24 inches.

The Bh horizon has hue of 5YR to 10YR, value of 3 to 5, and chroma of 4 to 6. In some pedons it contains few to many firm concretions, and in some it is not mottled.

The C horizon has hue of 10YR, value of 5 to 7, chroma of 2 to 6. Below a depth of 40 inches, it is sand to clay.

Lakewood Series

The Lakewood series consists of deep, excessively drained soils that formed in acid, coarse-textured Coastal Plain sediments. The Lakewood soils are on side slopes and toe slopes. Slope ranges from 2 to 8 percent.

Lakewood soils are on the landscape with Lakehurst, Atsion, Evesboro, and Keyport soils. The Lakewood soils are better drained than the Lakehurst or Atsion soils and have less clay than the Keyport soils. Unlike the Evesboro soils, the Lakewood soils have a bleached subsurface layer.

Typical pedon of Lakewood sand, 2 to 8 percent slopes, on the edge of Robertsville Road, midway between R.W. Dill Road and Hillsborough Road, Old Bridge Township:

A1—0 to 3 inches, very dark gray (10YR 3/1) sand; single grain; loose; many fine roots; extremely acid; clear wavy boundary.
A2—3 to 20 inches, light brownish gray (10YR 6/2) sand; single grain; loose; few roots; very strongly acid; gradual broken boundary.
B2hir—20 to 21 inches, discontinuous dark brown (7.5YR 4/4) sand; single grain; loose; few roots; sand grains coated; very strongly acid; gradual broken boundary.
B3hir—21 to 40 inches, yellowish brown (10YR 5/4) sand; single grain; loose; few roots; very strongly acid; gradual broken boundary.
C—40 to 60 inches, brownish yellow (10YR 6/6) sand; single grain; loose; few roots; very strongly acid.

The solum thickness ranges from 30 to 50 inches. The content of rounded quartzose pebbles ranges from 0 to 10 percent in the solum and from 0 to 5 percent in the C horizon.

The A1 horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The A2 horizon has hue of 10YR, value of 6 or 7, and chroma of 1 or 2. The A2 horizon ranges in thickness from 7 to 20 inches.

The Bhir horizon has hue of 5YR to 10YR, value of 4 or 5, and chroma of 4 to 8. In places, the Bhir horizon contains few concretions.

The C horizon has hue of 10YR, value of 6 or 7, and chroma of 4 to 8. In some pedons the C horizon is sandy loam at a depth of more than 40 inches.

Lansdowne Series

The Lansdowne series consists of deep, moderately well drained and somewhat poorly drained soils that formed in acid, fine-textured Piedmont sediments. The Lansdowne soils are on low-lying flats at the base of the Piedmont. Slope ranges from 0 to 5 percent.

Lansdowne soils are on the landscape with Fallsington Variant, Keyport, Klinesville, Penn, Reaville, and Reaville Variant soils. The Lansdowne soils have a finer textured subsoil than the Klinesville, Fallsington Variant, Reaville, Reaville Variant, or Penn soils; are deeper than the Klinesville, Reaville, or Reaville Variant soils; and formed

in residuum from red siltstone and shale bedrock, whereas the Keyport soils formed in marine sediments.

Typical pedon of Lansdowne silt loam, 0 to 2 percent slopes, 200 feet north of New Durham Road and 500 feet east of New Brooklyn Road, in Edison Township:

Ap—0 to 7 inches, dark brown (10YR 3/3) silt loam; weak fine granular structure; friable; many fine roots; 10 percent medium gravel; medium acid; abrupt smooth boundary.

B21t—7 to 16 inches, yellowish red (5YR 4/6) silty clay loam; strong medium subangular blocky structure; firm; common fine and medium roots; 10 percent gravel; common moderately thick clay films on faces of peds; strongly acid; gradual boundary.

B22t—16 to 36 inches, yellowish red (5YR 5/6) silty clay; few fine distinct pinkish white (5YR 8/2) mottles; strong fine and medium subangular blocky structure; very firm; few fine roots; 3 percent coarse fragments; continuous thick clay films on faces of peds; strongly acid; gradual wavy boundary.

B23t—36 to 50 inches, reddish brown (2.5YR 4/4) silty clay; few fine distinct pinkish white (5YR 8/2) mottles; strong medium prismatic structure parting to strong medium angular blocky; extremely firm; few fine roots; 3 percent coarse fragments; continuous thick clay films on faces of peds; strongly acid; gradual wavy boundary.

C—50 to 60 inches, reddish brown (2.5YR 4/4) clay loam; few fine distinct pinkish gray (7.5YR 7/2) mottles; massive; firm; few fine roots; 15 percent red shale fragments; medium acid.

The solum thickness ranges from 40 to 55 inches. The content of coarse fragments ranges from 2 to 15 percent in the solum. Reaction ranges from strongly acid to medium acid.

The Ap horizon has hue of 2.5YR or 10YR, value of 3 to 5, and chroma of 2 or 3.

The B horizon has hue of 5YR or 2.5YR, value of 3 to 5, and chroma of 4 or 6. It mainly is silty clay, silty clay loam, or clay loam. Thin strata of coarser textured material are in some pedons.

Some pedons have an R horizon that is fractured, partially weathered red shale.

Lansdowne Variant

The Lansdowne Variant consists of moderately deep, moderately well drained and somewhat poorly drained soils that formed acid, fine-textured Piedmont lacustrine and old alluvial sediments. The Lansdowne Variant soils are in small depressions at heads of streams, are on terraces, and are in drainageways. Slope ranges from 0 to 2 percent.

Lansdowne Variant soils are on the landscape with Klinesville, Reaville Variant, Lansdowne, and Parsippany soils. The Lansdowne Variant soils are deeper than the Klinesville or Reaville Variant soils, are shallower than the Lansdowne soils, are better drained than the Reaville Variant or Parsippany soils, and contain more clay in the subsoil than the Lansdowne soils.

Typical pedon of Lansdowne Variant silt loam, 0 to 2 percent slopes, 0.4 mile on Sidney Road from its intersection with Bremmer Road, Piscataway Township:

Ap—0 to 9 inches, dark reddish brown (2.5YR 3/4) silt loam; strong fine and medium granular structure; friable; many fine and medium roots; 5 percent coarse fragments; strongly acid; abrupt smooth boundary.

B21t—9 to 16 inches, dark reddish brown (5YR 3/2 and 2.5YR 3/4) silty clay loam; weak coarse subangular blocky structure; firm; common fine and medium roots; 3 percent coarse fragments; strongly acid; clear wavy boundary.

B22t—16 to 21 inches, yellowish red (5YR 5/8) silty clay; many large prominent gray (5YR 5/1) mottles; moderate coarse subangular blocky structure; very firm; few fine and medium roots; 5 percent coarse fragments; many moderately thick clay films on faces of peds and along root channels; strongly acid; clear irregular boundary.

B23t—21 to 25 inches, dark red (2.5YR 3/6) silt loam; many medium prominent gray (5YR 5/1) mottles and many medium distinct yellowish red (5YR 5/8) mottles; moderate medium and coarse subangular blocky structure; firm; few fine roots; 8 percent coarse fragments; common moderately thick clay films in interstitial pores and on faces of peds; strongly acid; abrupt irregular boundary.

R—25 inches, fragmented red shale bedrock.

The solum thickness ranges from 20 to 40 inches. The content of coarse fragments, mainly rounded gravel and fine to medium-size shale fragments, ranges from 5 to 10 percent in the solum. Reaction in unlimed areas ranges from strongly acid to extremely acid. The depth to shale bedrock ranges from 20 to 40 inches.

The A horizon has hue of 2.5YR to 10YR, value of 3 to 6, and chroma of 2 to 4.

The B horizon has hue of 10R to 10YR, value of 3 to 7, and chroma from 1 to 8. It is firm or very firm.

Manahawkin Series

The Manahawkin series consists of deep, very poorly drained organic soils that formed in acid organic sediments. Slope is less than 1 percent.

Manahawkin soils are on the landscape with Humaquepts and Klej and Hammonton soils, all of which are mineral soils.

Typical pedon of Manahawkin muck, 5 yards east of old trail, 30 yards northeast of Helmetta Boulevard, and 150 yards northwest of Lake Street, in Helmetta:

Oa1—0 to 12 inches, black (N 2/0) broken face and rubbed muck (sapric material); about 10 percent fiber, less than 2 percent rubbed; moderate coarse granular structure; primarily herbaceous fibers; extremely acid; clear wavy boundary.

Oa2—12 to 30 inches, dark reddish brown (5YR 2/2) broken face black (5YR 2/1) rubbed muck (sapric material); about 40 percent fibers, less than 5 percent rubbed; moderate coarse granular structure; mostly herbaceous fibers and some woody fibers; 10 percent woody coarse fragments up to 3 inches in diameter; extremely acid; clear wavy boundary.

IIC1—30 to 34 inches, very dark grayish brown (10YR 3/2) loamy sand; massive; friable; very strongly acid; gradual wavy boundary.

IIC2—34 to 60 inches, gray (N 6/0) sand; single grain; loose; extremely acid.

The solum thickness ranges from 10 to 50 inches. The content of silt and clay ranges from 5 to 15 percent in the O horizon and 5 to 30 percent in the IIC horizon. Reaction ranges from extremely acid to strongly acid.

The Oa1 horizon is neutral or has hue of 5YR to 10YR, value of 2 or 3, and chroma of 0 to 2. The content of fibers range from 5 to 16 percent. The remainder is muck. The fiber is mainly roots of grass, but some consists of partial remains of woody material from shrubs and trees.

The Oa2 horizon is neutral or has hue of 5YR to 10YR, value of 2, and chroma of 0 to 2. The content of fibers ranges from 5 to 10 percent. The remainder is muck. The fibers consist mostly of dead roots and small amounts of partially decayed grass and the remains of shrubs and trees.

The IIC horizon is neutral or has hue of 7.5YR to 10YR, value of 3 to 8, and chroma of 0 to 2. It is sand, loamy sand, or sandy clay or their gravelly analogs.

Matapeake Series

The Matapeake series consists of deep, well drained soils that formed in acid, medium-textured Coastal Plain sediments. The Matapeake soils are on divides, side slopes, and toe slopes in the southern part of the county. Slope ranges from 0 to 5 percent.

Matapeake soils are on the landscape with Mattapex, Sassafras, and Woodstown soils. The Matapeake soils do not have the mottles in the Bt horizon that are common to Mattapex and Woodstown soils and have a higher silt content than the Sassafras soils.

Typical pedon of Matapeake silt loam, 0 to 2 percent slopes, in a woodlot in South Brunswick, 200 feet south of Jamesburg Road, 6,000 feet east of U.S. Highway 130:

O2—1/2 inch to 0, moist matted partially decomposed leaves.

A11—0 to 1/2 inch, black (10YR 2/1) silt loam; weak fine granular structure; very friable; matted fine roots; extremely acid; abrupt irregular boundary.

A12—1/2 to 2 inches, dark brown (10YR 4/3) silt loam; weak medium granular structure; very friable; many fine roots; scattered very fine white mica; many fine to coarse pores; very strongly acid; clear irregular boundary.

A13—2 to 5 inches, dark yellowish brown (10YR 4/4) silt loam; weak medium granular structure; very friable; few 1/2 to 1 inch quartz pebbles; many pores; very strongly acid; clear wavy boundary.

A2—5 to 13 inches, yellowish brown (10YR 5/6) silt loam; weak medium subangular blocky structure; friable; many fine pores; 15 percent quartz pebbles; all peds appear coated with finely divided silica particles; common fine roots; very strongly acid; gradual smooth boundary.

B21t—13 to 21 inches, strong brown (7.5YR 5/6) silt loam; moderate medium subangular blocky structure; friable, slightly sticky; many fine pores; continuous clay film redder than ped interiors; common roots; fine few quartz pebbles; very strongly acid; gradual wavy boundary.

B22t—21 to 31 inches, yellowish brown (10YR 5/6) loam; moderate medium or strong subangular blocky structure; firm; very few fine roots; clay films continuous on peds; extremely acid; clear broken boundary.

IIC—31 to 63 inches, strong brown (7.5YR 5/6) gravelly sandy loam; massive; firm in place, friable when removed; 30 percent 1/2 inch to 2-inch quartz pebbles; coarse to medium sand, rounded, frosted, coated with clay; some grains clear and angular; bridge between sand grains; 1 to 2 percent dark minerals and few dull botryoidal dark grains; many fine pores; few coarse roots; clay films on bottoms of pebbles; extremely acid.

The solum thickness ranges from 24 to 34 inches. The content of rounded quartzose pebbles ranges from 0 to 2 percent in the solum and 1 to 34 percent in the C horizon. Reaction ranges from very strongly acid to extremely acid.

The A horizon has hue of 10YR, value of 2 to 5, and chroma of 1 to 4.

The B horizon has hue of 7.5YR and 10YR, value of 4 or 5, and chroma of 4 to 8. It is silt loam, loam, or silty clay loam and has prismatic or subangular blocky structure. Consistence is firm to moderately firm.

The C horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 5 or 6.

Mattapex Series

The Mattapex series consists of deep, moderately well drained soils that formed in acid, moderately fine

textured Coastal Plain sediments. The Mattapex soils are on divides and side slopes in the southern half of the county. Slope ranges from 0 to 5 percent.

Mattapex soils are on the landscape with Matapeake, Woodstown, Sassafras, and Fallsington soils. The mottling in Mattapex soils distinguishes them from the Matapeake and Sassafras soils. The Mattapex soils contain more silt in the solum than the Woodstown, Sassafras, or Fallsington soils and are not so gray in the solum as the Fallsington soils.

Typical pedon of Mattapex silt loam, 0 to 2 percent slopes, in a field 25 feet east of U.S. Highway 1 and 10 feet north of College Road, on the James Forrestal Campus of Princeton University, in Plainsboro Township:

Ap—0 to 10 inches, dark brown (10YR 4/3) silt loam; moderate fine and medium granular structure; friable; many fine and medium roots; strongly acid; abrupt smooth boundary.

B1—10 to 14 inches, yellowish brown (10YR 5/4) silt loam; weak medium subangular blocky structure; common fine roots; strongly acid; clear irregular boundary.

B2t—14 to 31 inches, yellowish brown (10YR 5/4) silty clay loam; moderate medium subangular blocky structure; firm; many thin clay films on ped faces and internal pores; few fine and medium root channels; strongly acid; clear wavy boundary.

IIB3—31 to 40 inches, yellowish brown (10YR 5/4) silty clay loam; many medium to coarse faint strong brown (7.5YR 5/6) and dark yellowish brown (10YR 4/4) mottles and few fine distinct light brownish gray (10YR 6/2) mottles; moderate medium and coarse subangular blocky structure; firm; strongly acid; clear wavy boundary.

IIC—40 to 60 inches, yellowish brown (10YR 5/4) fine sandy loam; many moderate to coarse faint strong brown (7.5YR 5/6) mottles; moderate medium and coarse subangular blocky structure; firm; stratified; strongly acid.

The solum thickness ranges from 30 to 40 inches. The content of rounded quartzose pebbles ranges from 0 to 2 percent in the solum and 0 to 35 percent in the C horizon. In unlimed areas reaction ranges from strongly acid to extremely acid.

The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 2 to 4. Some pedons have an A2 horizon with value of 5 and chroma of 3 to 6.

The B horizon has hue of 7.5YR and 10YR, value of 4 or 5, and chroma of 4 to 8. It is silt loam or silty clay loam.

The C horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 8. It mainly is sandy loam, fine sandy loam, gravelly sandy loam, gravelly sandy clay loam, loamy sand, or gravelly loamy sand. Strata of finer material are in some pedons, mainly at a depth of more than 40 inches.

Mount Lucas Series

The Mount Lucas series consists of deep, moderately well drained soils that formed from weathered diabase and basalt rocks. Mount Lucas soils are on south-facing slopes of Little Rocky Hill and on slight knolls and flats near Little Rocky Hill. Slope ranges from 0 to 5 percent.

Mount Lucas soils are on the landscape with Watchung, Keyport, Elkton, Woodstown, and Chalfont soils. The Mount Lucas soils have less clay in the B horizon than the Elkton or Keyport soils and are better drained than the Watchung soils. Unlike the Woodstown soils, the Mount Lucas soils are underlain by diabase bedrock. The Mount Lucas soils do not have the fragipan common to the Chalfont soils.

Typical profile of Mount Lucas silt loam, in an area of Mount Lucas very stony silt loam, 0 to 5 percent slopes, 30 feet west of U.S. Highway 1 and 100 yards south of Grandview Road, in South Brunswick Township:

Ap—0 to 6 inches, dark grayish brown (10YR 4/2) silt loam; moderate medium and coarse granular structure; friable; common fine and medium roots; 10 percent coarse fragments; 3 percent of surface covered by diabase rock fragments 1 to 2.5 feet in diameter; medium acid; abrupt smooth boundary.

B21t—6 to 15 inches, yellowish brown (10YR 5/6) silty clay loam; few fine faint strong brown (7.5YR 5/6) mottles; coarse subangular blocky structure; slightly firm; common fine and medium roots; weak clay films; 10 to 15 percent diabase rock fragments 1 to 2.5 feet in diameter; medium acid; gradual wavy boundary.

B22t—15 to 24 inches, strong brown (7.5YR 5/6) silty clay loam; strong fine subangular blocky structure; firm; common fine roots; strong clay films on peds, along roots channels, and around stones; 10 to 15 percent diabase (trap) rock fragments up to 1.5 feet in diameter; medium acid; gradual wavy boundary.

B3—24 to 30 inches, strong brown (7.5YR 5/6) silty clay loam; few to common fine to medium distinct pinkish gray (7.5YR 7/2) and gray (7.5YR 6/0) mottles; strong fine and medium subangular blocky structure; friable; few fine roots; 10 to 15 percent rock fragments up to 0.5 foot in diameter, most diabase but some saprolictic; slightly acid; diffuse broken boundary.

C—30 to 60 inches, strong brown (7.5YR 5/6) gravelly clay loam; many medium prominent light gray (10YR 7/1) mottles; massive; very friable; 40 to 50 percent diabase (trap) rock fragments, some disintergrated rock ranging from sand size to 5 feet in diameter; slightly acid.

The solum thickness ranges from 25 to 36 inches. The content of coarse fragments ranges from 5 to 25 percent in the solum and from 20 to 60 percent in the C horizon.

The coarse fragments are nearly all diabase and basalt (trap) stones and rocks. The depth to bedrock is more than 5 feet. Reaction ranges from neutral to strongly acid.

The Ap horizon has hue of 10YR, value of 3 to 5, and chroma of 2 or 3.

The B horizon has hue of 10YR or 7.5YR, value of 5, and chroma of 4 to 8. It is friable or firm silty clay loam or clay loam.

The C horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 8. It is gravelly clay loam, gravelly loam, or gravelly sandy loam.

Mullica Series

The Mullica series consists of deep, very poorly drained soils that formed in acid, moderately coarse textured Coastal Plain sediments. The Mullica soils are in low, wet areas that receive runoff from the surrounding soils. Slope generally is less than 1 percent.

Mullica soils are on the landscape with Hammonton, Woodstown, and Fallsington soils. The Mullica soils are more gray in the Bt horizon than the Hammonton and Woodstown soils, have a thicker and darker A1 or Ap horizon than the Fallsington soils, and are coarser textured in the Bt horizon than the Fallsington soils.

Typical pedon of Mullica sandy loam, 2,000 feet east of Fresh Ponds Road, 450 feet south of Deans Rhode Hall Road, 50 feet east of ditch, in Pigeon Swamp, South Brunswick Township:

O2—4 inches to 0, black (10YR 2/1) muck; moderate fine and medium granular structure; friable; many fine and medium roots; strongly acid; gradual boundary.

A1—0 to 7 inches, very dark gray (10YR 3/1) sandy loam; moderate fine and medium granular structure; friable; many fine roots; 2 percent rounded quartzose gravel; strongly acid; gradual broken boundary.

B2t—7 to 20 inches, light brownish gray (10YR 6/2) sandy loam; many fine and medium faint yellowish brown (10YR 5/4) mottles and few fine distinct brown (7.5YR 5/4) mottles; weak and moderate medium subangular blocky structure; friable; common fine roots; common clay bridging; 2 percent rounded quartzose gravel; very strongly acid; gradual smooth boundary.

B3—20 to 28 inches, light brownish gray (10YR 6/2) gravelly sandy loam; many distinct brown (7.5YR 5/4) mottles; weak medium subangular blocky structure; very friable; few fine roots; 15 percent rounded quartzose gravel; very strongly acid; abrupt smooth boundary.

IIC—28 to 60 inches, greenish gray (5G 6/1) stratified gravelly sandy loam, sandy clay loam, and loamy sand; massive; friable; 15 percent rounded quartzose gravel; very strongly acid few fine roots.

The solum thickness ranges from 28 to 40 inches. The content of coarse fragments ranges from 2 to 20 percent in the solum and from 5 to 35 percent in the C horizon. Unless limed, the soil ranges from strongly acid to extremely acid.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1. Some pedons have an A2 horizon that has hue of 10YR, value of 4 or 5, and chroma of 1 to 3.

The B horizon has hue of 10YR, value of 4 to 6, and chroma of 1 to 4. It is sandy loam or fine sandy loam.

The C horizon has hue of 10YR or 5Y, value of 4 to 6, and chroma of 1 or 2. It is stratified material ranging from loamy sand to sandy clay loam.

Nixon Series

The Nixon series consists of deep, well drained soils that formed in acid, moderately fine textured Coastal Plain sediments. The Nixon soils are on high terraces, divides, and side slopes. Slope ranges from 0 to 5 percent.

Nixon soils are on the landscape with Nixon Variant, Lansdowne, Fallsington Variant, and Sassafras soils. The Nixon soils do not have the mottles in the Bt horizon that are common to the Nixon Variant and Lansdowne soils or the gray color common to the Fallsington Variant soils. The Nixon soils are yellowish red or red in the subsoil; the Sassafras soils are yellowish brown or strong brown.

Typical profile of Nixon loam, 0 to 2 percent slopes, beneath a high power electric line, 150 feet east of the intersection of Tuthill Road and Pennington Road, in North Brunswick Township:

Ap—0 to 8 inches, brown (7.5YR 4/4) loam; weak medium granular structure; friable; many fine roots; 5 percent rounded quartzose pebbles; very strongly acid; abrupt smooth boundary.

A3—8 to 11 inches, strong brown (7.5YR 5/6) loam; moderate medium subangular blocky structure; friable; common fine roots; 5 percent rounded quartzose pebbles; very strongly acid; clear wavy boundary.

B2t—11 to 30 inches, yellowish red (5YR 4/6) loam; moderate medium subangular blocky structure; friable; few fine roots; few thin clay films faces of peds; 5 percent rounded quartzose pebbles and red shale fragments; red shale detrital material in fine earth fraction; very strongly acid; clear wavy boundary.

IIB3—30 to 40 inches, yellowish red (5YR 4/6) sandy loam; weak medium subangular blocky structure; friable; few fine roots; common thin clay films on faces of peds; 5 percent rounded quartzose pebbles and red shale fragments; red shale detrital material in fine earth fraction; very strongly acid; clear smooth boundary.

IIC—40 to 60 inches, strong brown (7.5YR 5/6) sandy loam; structureless; massive; very friable; stratified; 10 percent rounded quartzose pebbles; very strongly acid.

The solum thickness ranges from 30 to 45 inches. Coarse fragments are rounded pebbles and cobblestones and angular red shale fragments. They make up 5 to 20 percent of the solum to 5 to 30 percent in the C horizon. Reaction in unlimed areas ranges from strongly acid to extremely acid.

The A horizon has hue of 7.5YR or 10YR, value of 2 to 4, and chroma of 1 to 4.

The A3 horizon has hue of 5YR to 10YR, value of 4 to 6, chroma of 4 to 6.

The B horizon has hue of 5YR or 2.5YR, value of 3 or 4, and chroma of 4 to 6. It is sandy loam, loam, or sandy clay loam.

The C horizon has hue of 10YR or 7.5YR, value of 5, and chroma of 4 to 6. It is sandy loam or loamy sand or their gravelly analogs. It generally is stratified. Red shale bedrock is at a depth of more than 60 inches.

Nixon Variant

The Nixon Variant consists of deep, moderately well drained soils that formed in acid, moderately fine textured Coastal Plain sediments. The Nixon Variant soils are on high terraces, intermediate positions on the landscape, and toe slopes. Slope ranges from 0 to 5 percent.

Nixon Variant soils are on the landscape with Nixon, Lansdowne, Fallsington Variant, and Sassafras soils. The Nixon Variant soils contain mottles in the Bt horizon; the Nixon and Sassafras soils are not mottled. The Nixon Variant soils are fine-loamy; the Lansdowne soils are fine. The Nixon Variant soils have a yellowish red or red subsoil; the Fallsington Variant soils have a gray subsoil.

Typical profile of Nixon Variant loam, in an area of Nixon Variant-Urban land complex, 0 to 5 percent slopes, in a vacant lot at 3d Avenue and Georges Road, North Brunswick Township:

A1—0 to 8 inches, very dark grayish brown (10YR 3/2) loam; moderate medium granular structure; friable; many fine and medium roots; 1 percent rounded pebbles; strongly acid; gradual irregular boundary.

A21—8 to 11 inches, dark brown (7.5YR 4/4) loam; moderate medium subangular blocky structure; friable; common fine roots; 2 percent rounded quartzose pebbles; strongly acid; gradual irregular boundary.

A22—11 to 16 inches, strong brown (7.5YR 5/8) loam; weak medium subangular blocky structure; friable; common fine roots; 2 percent rounded quartzose pebbles; strongly acid; clear irregular boundary.

B1t—16 to 24 inches, yellowish red (5YR 5/6) loam; moderate medium subangular blocky structure; friable; common fine roots; common thin clay films line tubular interstitial pores; 2 percent rounded quartzose pebbles; strongly acid; clear irregular boundary.

B2t—24 to 30 inches, yellowish red (5YR 5/6) loam; common fine distinct reddish brown (2.5YR 4/4) mottles and common many prominent white (10YR 8/2) mottles; medium subangular blocky structure; firm; common thin clay films line tubular interstitial pores; common fine roots; 3 percent rounded quartzose pebbles; strongly acid; gradual irregular boundary.

B3—30 to 38 inches, yellowish red (5YR 5/6) sandy loam; common fine distinct reddish brown (2.5YR 4/4) mottles and many large prominent white (10YR 8/2) mottles; weak medium subangular blocky structure; slightly hard (dry); few fine roots; 10 percent rounded quartzose pebbles; strongly acid; gradual irregular boundary.

C—38 to 60 inches, very pale brown (10YR 8/3) stratified sandy loam; common large distinct brownish yellow (10YR 6/8) mottles; massive; extra hard (dry); friable; few fine roots; strongly acid; gradual irregular boundary.

The solum thickness ranges from 30 to 50 inches. Coarse fragments are rounded quartzose pebbles and cobblestones and angular red shale fragments. They make up 0 to 20 percent of the solum and 0 to 40 percent of the C horizon. Reaction in unlimed areas ranges from extremely acid to strongly acid.

The A1 horizon has hue of 7.5YR or 10YR, value of 2 to 4, and chroma of 1 to 4. It is loam or sandy loam.

The A2 horizon has hue of 5YR to 10YR, value of 4 to 6, and chroma of 3 to 8.

The B horizon has hue of 5YR or 2.5YR, value of 4 to 6, and chroma of 4 to 8. It is loam, sandy loam, or sandy clay loam or their gravelly analogs. Consistence is friable or firm.

The C horizon has hue of 2.5YR to 10YR, value of 4 to 8, and chroma of 2 to 6. It is sandy loam or loamy sand or their gravelly analogs. Red shale is at a depth of more than 60 inches.

Parsippany Series

The Parsippany series consists of deep, poorly drained soils that formed in acid, fine-textured Piedmont sediments. The Parsippany soils are on flood plains. Slope is less than 1 percent.

Parsippany soils are on the landscape with Lansdowne, Reaville Variant, Klinesville, Ellington, and Woodstown soils. The Parsippany soils are wetter than the Lansdowne soils and are finer textured than the Ellington or Woodstown soils. The Parsippany Variant soils do not have the shale bedrock common to the Lansdowne and Reaville Variant soils and have a high

seasonal water table that is not common to the Klinesville soils.

Typical profile of Parsippany silt loam, between U.S. Highway 1 and ConRail Railroad, 1,800 feet northwest of Black Horse Lane, near Oakey's Brook in South Brunswick Township:

A1—0 to 2 inches, very dark brown (10YR 2/2) silt loam; weak fine granular structure; friable; slightly sticky, nonplastic; many fine roots; strongly acid; clear wavy boundary.

A3g—2 to 8 inches, pinkish gray (7.5YR 7/2) silt loam; fine and medium strong brown (7.5YR 5/6) mottles and few dark yellowish brown (10YR 3/4) mottles; moderate subangular blocky structure; friable; slightly sticky, nonplastic; very strongly acid; gradual wavy boundary.

B1tg—8 to 12 inches, pinkish gray (7.5YR 7/2) silty clay loam; many fine and medium strong brown (7.5YR 5/6) mottles and few dark yellowish brown (10YR 3/4) mottles; moderate medium subangular blocky structure; friable to firm; medium roots; common thin discontinuous clay film on faces of peds; strongly acid; gradual wavy boundary.

B21tg—12 to 24 inches; pinkish gray (7.5YR 7/2) silty clay; many fine medium strong brown (7.5YR 5/6) and light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky and moderate fine angular blocky structure; firm; few fine and medium roots; thick clay films coating root channels and interstitial pores; strongly acid; gradual wavy boundary.

B22tg—24 to 36 inches, reddish brown (5YR 4/4) silty clay; many medium to coarse strong brown (7.5YR 5/6) mottles and many fine to medium light brownish gray (10YR 6/2) mottles; moderate medium to coarse subangular blocky structure; firm; few fine medium roots; thick clay films coating roots channels and interstitial pores; slightly acid; gradual wavy boundary.

B3tg—36 to 46 inches, reddish brown (5YR 4/4) silty clay loam; many medium to coarse strong brown (7.5YR 5/6) mottles and many fine medium light brownish gray (10YR 6/2) mottles; weak medium angular blocky and subangular blocky structure; firm; few fine roots; moderately thick clay films along root channels; slightly acid; gradual wavy boundary.

C—46 to 60 inches, reddish brown (5YR 4/4) sandy loam; many medium to coarse strong brown (7.5YR 5/6) mottles and many fine to medium light brownish gray (10YR 6/2) mottles; single grain; friable; neutral.

The solum thickness ranges from 30 to 60 inches. The content of coarse fragments ranges from 0 to 5 percent in the solum and 0 to 10 percent in the substratum. Reaction ranges from strongly acid near the surface to mildly alkaline in the substratum.

The A horizon has hue of 10YR to 5YR, value of 2 to 7, and chroma of 1 to 6.

The B horizon has hue of 10YR to 5YR, value of 4 to 7, and chroma of 1 to 6. It is silty clay loam, clay loam, or clay.

The C horizon has hue of 2.5YR or 5YR, value of 4 to 6, and chroma of 2 to 6. Below a depth of 40 inches it ranges from loamy sand to silty clay.

Parsippany Variant

The Parsippany Variant consists of deep, very poorly drained soils that formed in large flats of fine-textured lacustrine deposits in the Dismal Swamp area and in drainageways in Edison and South Plainfield Townships. Slope is less than 1 percent.

Parsippany Variant soils are on the landscape with Parsippany, Haledon Variant, and Fallsington Variant soils. Haledon Variant and Fallsington Variant soils are gray, are lighter textured in the subsoil, and are poorly drained.

Typical profile of Parsippany Variant silt loam, 100 yards southwest of the intersection of the Perth Amboy Branch of the Lehigh Valley Railroad and the South Plainfield-Edison boundary, in South Plainfield:

A1—0 to 3 inches, black (N 2/0) silt loam; strong fine and medium granular structure; firm; many fine and medium roots; very strongly acid; clear irregular boundary.

B2t—3 to 19 inches, black (N 2/0) clay; moderate and strong coarse subangular blocky structure; very firm; few roots; continuous thick clay films on faces of peds; strongly acid; abrupt smooth boundary.

B3t—19 to 23 inches, gray (10YR 5/1) silty clay loam; few medium and large prominent brownish yellow (10YR 6/6) mottles; moderate medium subangular blocky structure; friable; few roots; common thin clay films on faces of peds; medium acid; clear smooth boundary.

C1—23 to 33 inches, brown (7.5YR 5/4) coarse loamy sand; common medium faint brown (10YR 5/3) mottles; single grain; loose; few roots; slightly acid; abrupt smooth boundary.

C2—33 to 36 inches, dark brown (10YR 3/3) fine sandy loam; common to many medium to large prominent greenish gray (5GY 5/1) mottles; massive; friable; medium acid; abrupt smooth boundary.

C3—36 to 60 inches, dark reddish gray (5YR 4/2) sandy loam; weak medium granular structure; friable; medium acid.

The solum thickness ranges from 19 to 38 inches. The content of coarse fragment ranges from 0 to 5 percent in the solum and from 0 to 10 percent in the C horizon. Reaction ranges from very strongly acid to slightly alkaline.

The A horizon is neutral or has hue of 7.5YR, 10YR, or 2.5Y; value of 2; and chroma of 0 or 1.

The B horizon is neutral or has hue of 7.5YR, 10YR, or 2Y; value of 3 to 5; and chroma of 0 to 2. It ranges from silty clay loam to silty clay.

The C horizon is neutral or has hue of 2.5YR to 10YR, value of 4 to 6, and chroma of 0 to 4. It is sandy loam to sand.

Pemberton Series

The Pemberton series consists of deep, moderately well drained or somewhat poorly drained soils that formed in acid Coastal Plain sediments containing medium or small amounts of glauconite. The surface appears to be a windblown deposit. The Pemberton soils are on divides, terraces, and side slopes. Slope ranges from 0 to 3 percent.

Pemberton soils are on the landscape with Tinton, Homdel, and Shrewsbury soils. The Pemberton soils have low-chroma mottles that are not common to the Tinton soils and do not have the low-chroma matrix colors common to the Shrewsbury soils. The A horizon of the Pemberton soils is thicker than that of the Homdel soils.

Typical pedon of Pemberton loamy sand, 0 to 3 percent slopes, in Monroe Township, 200 yards south of New Jersey Highway 33, 3,333 feet east of Applegarth Road:

Ap—0 to 8 inches, dark yellowish brown (10YR 4/4) loamy sand; single grain; loose; 2 percent glauconite; few fine roots; medium acid; abrupt smooth boundary.

A2—8 to 28 inches, yellowish brown (10YR 5/6) loamy sand; single grain; loose; 2 percent glauconite; few fine roots; strongly acid; gradual wavy boundary.

B2t—28 to 45 inches, yellowish brown (10YR 5/6) sandy loam; common fine light olive gray (5Y 6/2) and pinkish gray (7.5YR 6/2) mottles; weak medium subangular blocky structure; friable; 10 percent glauconite; 5 percent moderate discontinuous clay bridging between sand grains; few fine roots; very strongly acid; gradual wavy boundary.

C—45 to 60 inches, yellowish brown (10YR 5/6) sand; common fine light olive gray (5Y 6/2) and pinkish gray (7.5YR 6/2) mottles; single grain; loose; 3 percent glauconite; very strongly acid.

The solum thickness ranges from 24 to 48 inches. The content of coarse fragments ranges from 0 to 15 percent in thin strata in the B and C horizon. These coarse fragments are mostly fine to medium-size quartz pebbles or ironstone fragments. Reaction of the soil in unlimed areas ranges from strongly acid to extremely acid.

The Ap horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 or 4. It is sand or loamy sand.

The B horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 4 to 6. It is sandy loam or sandy clay loam.

The C horizon has hue of 10YR, value of 4 or 5, and chroma of 4 to 6. It is stratified loamy sand, sandy loam, and sand containing varying amounts of glauconite.

Penn Series

The Penn series consists of moderately deep, well drained soils that formed in acid fractured shale bedrock. The Penn soils are on slight divides and side slopes. Slope ranges from 0 to 5 percent.

Penn soils are on the landscape with Reaville, Klinesville, and Nixon soils. The Penn soils do not have the mottles typical of the Reaville soils, are deeper to bedrock than the Klinesville soils, and developed in weathered red shale bedrock, while the Nixon soils developed in a deposit over red shale bedrock.

Typical pedon of Penn silt loam, 0 to 2 percent slopes, 50 yards north of Carlisle Road, 0.2 mile east of New Jersey highway 27, in North Brunswick Township:

Ap—0 to 8 inches, dark reddish brown (2.5YR 3/4) silt loam; moderate fine granular structure; friable; few fine roots; 1 percent moderately coarse quartz pebbles; 5 percent red shale fragments; very strongly acid; abrupt smooth boundary.

B21t—8 to 14 inches, dark reddish brown (2.5YR 3/4) silt loam; moderate fine and medium subangular blocky structure; firm; few roots; common moderately thick clay films in fine interstitial pores; 1 percent medium coarse quartz pebbles; 10 percent red shale fragments; very strongly acid; gradually wavy boundary.

B22t—14 to 20 inches, dark reddish brown (2.5YR 3/4) silt loam; moderate fine and medium subangular blocky structure; very firm; few fine roots; common moderately thick clay films in fine interstitial pores; 1 percent medium coarse quartz pebbles; 10 percent red shale fragments; very strongly acid; gradual wavy boundary.

B3—20 to 25 inches, dark reddish brown (2.5YR 3/4) shaly silt loam; moderate fine and medium subangular blocky structure; firm; few thin clay films in pores; few fine roots; 30 percent red shale fragments; very strongly acid; gradual wavy boundary.

C—25 to 32 inches, dark reddish brown (2.5YR 3/4) very shaly silt loam; massive; firm; 60 percent red shale fragments; very strongly acid; gradual wavy boundary.

R—32 inches, dark red (2.5YR 3/6) shale bedrock.

The solum thickness is 20 to 34 inches, and the depth to bedrock ranges from 20 to 40 inches. The content of coarse fragments, which are nearly all shale fragments,

ranges from 5 to 25 percent in the A horizon and 10 to 25 percent in the B horizon. The Ap horizon has hue of 5YR or 2.5YR, value of 3, and chroma of 3 or 4.

The B horizon has hue of 5YR or 2.5YR, value of 3, and chroma of 3 or 4. Consistence is firm or very firm.

The C horizon is similar in color and texture to the B horizon. The R horizon is bedded red shale. It is jointed red shale bedrock. The cracks are filled with weathered soil and alluvial clay.

Phalanx Series

The Phalanx series consists of deep, well drained soils that formed in acid, moderately coarse textured Coastal Plain sediments. Phalanx soils are mostly on hills, mountains, and side slopes, generally at the highest elevations in the area. Slope ranges from 2 to 15 percent.

Phalanx soils are on the landscape with Downer, Evesboro, Sassafras, and Keyport soils. The Phalanx soils contain more ironstone fragments than any of those soils, contain less clay in the Bt horizon than the Sassafras or Keyport soils, and have a Bt horizon, which is not typical of the Evesboro soils.

Typical pedon of Phalanx loamy sand, 2 to 15 percent slopes, in an excavation 1,670 feet southwest of the intersection of U.S. highway 1 and Major Road, in South Brunswick:

O1—1 inch to 0, black (5YR 2/1) peat; many fibrous roots; clear broken boundary.

A—0 to 7 inches, yellowish red (5YR 5/6) loamy sand; massive; very friable; many fine and medium roots; 1 to 2 percent fine ironstone fragments; extremely acid; gradual boundary.

Bt—7 to 30 inches, yellowish red (5YR 5/6) gravelly sandy loam; weak medium subangular blocky structure; very friable; many fine and medium roots; 30 percent angular ironstone fragments 1/4 inch to 3 inches thick and up to 6 inches in diameter; all sand grains coated with clay; very strongly acid; gradual wavy boundary.

C—30 to 60 inches, red (2.5YR 5/6) loamy sand; single grain; loose; 40 percent angular ironstone fragments ranging from 1/8 inch to 2 feet in length; very strongly acid.

The solum thickness ranges from 24 to 40 inches. The content of angular ironstone gravel, cobblestones, and stones in the B horizon ranges from 10 to 15 percent. The content of coarse fragments ranges from 10 to 60 percent in the substratum. The ironstone fragments are mostly 6 inches in diameter and 1/4 inch to 3 inches thick, but in some pedons the fragments are 1/2 inch to 2 feet thick and 1 to 5 feet in diameter. In some pedons the substratum is iron cemented sandstone 5 to 10 feet thick. Some pedons have clay strata in the C horizon that caused the iron to precipitate above it.

The A horizon has hue of 2.5YR to 5YR, value of 4 or 5, and chroma of 4 to 6.

The B horizon has hue of 2.5YR to 5YR, value of 4 to 6, and chroma of 4 to 6. It is gravelly sandy loam, gravelly loamy sand, and very gravelly sandy loam.

The C horizon has hue of 2.5YR to 5YR, value of 4 to 6, and chroma of 4 to 6. It is sand, loamy sand, sandy loam, and gravelly loamy sand.

Psamments

Psamments in Middlesex County consist of moderately deep to deep, excessively drained to somewhat poorly drained soils that formed in stratified or graded sandy fill material.

Because of the variability of these soils, a typical pedon is not given. The soils are 20 to 60 inches deep or more to the original soil or waste fill. They are extremely acid or very strongly acid.

Reaville Series

The Reaville series consists of shallow, moderately well drained soils that formed in acid, medium-textured red shale. The Reaville soils are on divides and side slopes. Slope ranges from 0 to 5 percent.

Reaville soils are on the landscape with Lansdowne, Klinesville, Ellington, and Rowland soils. The Reaville soils are not as deep to bedrock as the Lansdowne soils, are deeper to bedrock than the Klinesville soils, and have more clay in the B horizon than the Ellington soils. The profile in the Reaville soils is more developed than that in the Rowland soils, and the Rowland soils are subject to flooding.

Typical profile of Reaville silt loam, 2 to 5 percent slopes, 100 feet north of Morris Avenue and 25 feet east of Blue Ridge Avenue, in Piscataway Township:

Ap—0 to 10 inches, dark reddish brown (5YR 3/4) silt loam; moderately fine and medium granular structure; friable; many fine roots and few medium roots; 1 percent very fine quartz sand grains; 1 percent fine red shale fragments; slightly acid; clear irregular boundary.

B1—10 to 15 inches; light reddish brown (5YR 6/4) shaly silt loam; moderate fine and medium subangular blocky structure; friable; common fine roots; 25 percent dark reddish brown (2.5YR 3/4) angular pieces of red shale 3/4 inch to 1.5 inches long; slightly acid; abrupt smooth boundary.

B2t—15 to 22 inches, reddish brown (2.5YR 4/4) shaly silt loam; common to many medium prominent gray (10YR 5/1) mottles; moderate fine and medium subangular blocky structure; firm; few roots; common clay films on faces of peds; 35 percent angular pieces of red shale; slightly acid; abrupt smooth boundary.

C—22 to 28 inches, reddish brown (2.5YR 4/4) very shaly silt loam; fine to medium common to many distinct dark reddish brown (2.5YR 3/4) and reddish brown (5YR 5/3) mottles; massive; firm; 50 percent red shale fragments; slightly acid; gradual irregular boundary.
R—28 inches, dark reddish brown (2.5YR 3/4) jointed and partially weathered shale bedrock.

The solum thickness ranges from 12 to 24 inches. The content of coarse fragments ranges from 2 to 35 percent in the solum. Reaction ranges from slightly acid to strongly acid.

The Ap horizon has hue of 2.5YR or 5YR, value of 3 or 4, and chroma of 2 to 4. It is silt loam or shaly silt loam.

The B horizon has hue of 2.5YR or 5YR, value of 4 or 6, and chroma of 3 or 4. It is silt loam or shaly silt loam. Consistence is friable or firm. The edges of peds and the shale fragments are mottled gray.

The C horizon has hue of 2.5YR or 5YR, value of 3 to 5, and chroma of 3 or 4.

Reaville Variant

The Reaville Variant consists of moderately deep, poorly drained soils that formed in residuum from siltstone or shale. The Reaville Variant soils are in drainageways of the Piedmont. Slope ranges from 0 to 2 percent.

Reaville Variant soils are on the landscape with Reaville, Lansdowne Variant, and Parsippany soils. The Reaville Variant soils are more gray than the Reaville, Lansdowne, or Lansdowne Variant soils; are deeper to bedrock than the Reaville or Lansdowne Variant soils; and have less clay than the Parsippany soils.

Typical pedon of Reaville Variant silt loam, 0 to 2 percent slopes, 100 yards south of New Jersey highway 27 and 100 yards east of Sand Hills Road, in South Brunswick Township:

Ap—0 to 8 inches, dark brown (10YR 3/3) silt loam; weak fine and medium subangular blocky structure; friable; many fine roots; medium acid; gradual irregular boundary.
B21tg—8 to 20 inches, gray (10YR 6/1) silty clay loam; common to many fine to medium prominent yellowish brown (10YR 5/6) and dark brown (10YR 3/3) mottles; strong fine and medium subangular blocky structure; firm; few fine roots; common clay films on faces of peds; slightly acid; clear irregular boundary.
B22tg—20 to 25 inches, reddish brown (5YR 4/3) silty clay loam; common to many fine to medium distinct light brownish gray (10YR 6/2) and strong brown (7.5YR 5/6) mottles; medium subangular blocky structure; common clay films on faces of peds; very firm; few fine roots; strongly acid; clear wavy boundary.
C—25 to 30 inches, dark reddish brown (2.5YR 3/4) very shaly silty clay loam; massive; very firm; 50 percent shale fragments; strongly acid; clear smooth boundary.
R—30 inches, dark reddish brown (2.5YR 3/4) shale bedrock.

The solum thickness ranges from 20 to 35 inches. The depth to bedrock is 20 to 40 inches. The content of coarse fragments ranges from 0 to 5 percent in the solum and 50 to 75 percent in the C horizon. Reaction ranges from slightly acid to strongly acid.

The Ap horizon has value of 3 or 4 and chroma of 3 or 4.

The B horizon has hue of 10YR to 5YR, value of 5 or 6, and chroma of 1 to 3. It has strong blocky structure, or the horizon is massive. Consistence is firm or very firm. Texture is silty clay loam or clay loam.

The C horizon has hue of 2.5YR or 5YR, value of 3 or 4, and chroma of 4 to 6. It is silt loam or very shaly silty clay loam, and is loosely bedded in place in some areas.

Rowland Series

The Rowland series consists of deep, moderately well drained or somewhat poorly drained soils that formed in medium-textured alluvium. The Rowland soils are in stream bottoms on the northwestern side of the county. Slope ranges from 0 to 2 percent.

Rowland soils are on the landscape with Reaville Variant, Klinesville, Lansdowne, Dunellen, Ellington, and Reaville soils. The Rowland soils are less developed than the Reaville Variant, Lansdowne, Dunellen, or Reaville soils; have a thicker solum than the Klinesville or Reaville; and are finer textured than the Ellington soils.

Typical pedon of Rowland silt loam, on the east bank of Green Brook, 100 yards north of Union Bound Brook Road:

A1—0 to 3 inches, dark brown (7.5YR 3/2) silt loam; moderate fine and medium granular structure; friable; many fine roots; medium acid; gradual wavy boundary.
A2—3 to 7 inches, dark brown (7.5YR 4/4) silt loam; moderate fine and medium granular structure; friable; many fine roots; medium acid; gradual wavy boundary.
B21—7 to 15 inches, dark brown (7.5YR 4/4) silt loam; common fine prominent yellowish red (5YR 4/8) mottles; moderate medium subangular blocky structure; firm; common medium roots; strongly acid; gradual wavy boundary.
B22—15 to 36 inches, reddish brown (5YR 4/4) silt loam; many coarse prominent light gray (10YR 6/1)

mottles; moderate fine and medium subangular blocky structure; friable; common medium roots; moderate continuous clay coats on peds; strongly acid; gradual wavy boundary.

B3—36 to 40 inches, reddish brown (5YR 4/4) silt loam; common to many medium prominent light gray (10YR 6/1) mottles; moderate medium subangular blocky structure; friable; few fine roots; strongly acid; gradual wavy boundary.

C1—40 to 50 inches, gray (10YR 6/1) silt loam; massive; friable; medium acid; abrupt smooth boundary.

C2—50 to 60 inches, dark gray (10YR 4/1) sandy loam; massive; friable; medium acid.

The solum thickness ranges from 24 to 40 inches. The content of coarse fragments ranges from 0 to 10 percent in the solum and 0 to 40 percent in the C horizon. Reaction ranges from very strongly acid to medium acid.

The A horizon has hue of 7.5YR to 5YR, value of 3 or 4, and chroma of 2 to 4.

The B horizon has hue of 7.5YR to 5YR, value of 3 to 5, and chroma of 3 to 6. It is loam, silt loam, or clay loam. Consistence is friable or firm.

The C horizon has hue of 10YR to 5YR, value of 4 to 6, and chroma of 1 or 2. The texture of the C horizon above a depth of 40 inches mainly is sandy loam, sandy clay loam, silt loam, or silty clay loam; below 40 inches it mainly is stratified sand or gravelly sand and finer textured lenses or strata. Some pedons have different types of gravel, some of which is red shale.

Sassafras Series

The Sassafras series consists of deep, well drained soils that formed in acid, moderately fine textured Coastal Plain sediments. The Sassafras soils are on uplands and side slopes. Slope ranges from 0 to 15 percent.

Sassafras soils are on the landscape with Woodstown, Downer, Matapeake, and Mattapex soils. The Sassafras soils do not have the mottles in the Bt horizon that are common to the Woodstown and Mattapex soils, contain more sand in the solum than the Mattapex or Matapeake soils, and contain more clay in the Bt horizon than the Downer soils.

Typical pedon of Sassafras sandy loam, 2 to 5 percent slopes, 75 feet east of the intersection of County Road 535 and Davidson Mill Road at Rhode Hall, South Brunswick Township:

Ap—0 to 8 inches, dark brown (10YR 3/3) sandy loam; weak medium granular structure; very friable; many fine roots; 5 percent fine and medium quartz pebbles; very strongly acid; abrupt smooth boundary.

A2—8 to 17 inches, yellowish brown (10YR 5/6) sandy loam; weak medium granular structure; very friable; many fine roots; 5 percent fine and medium quartz pebbles; very strongly acid; gradual wavy boundary.

B1t—17 to 25 inches, yellowish brown (10YR 5/8) sandy clay loam; weak medium subangular blocky structure; friable; 8 percent fine and medium quartz pebbles; few fine roots; continuous moderately thick clay films on faces of peds and in pores; very strongly acid; gradual wavy boundary.

B2t—25 to 37 inches, strong brown (7.5YR 5/6) sandy clay loam; moderate medium and coarse subangular blocky structure; friable; 5 to 10 percent fine and medium quartz pebbles; few fine roots; many moderately thick clay films on faces of peds; very strongly acid; gradual wavy boundary.

B3—37 to 42 inches, strong brown (7.5YR 5/8) sandy loam; weak medium and coarse subangular blocky structure; friable; 5 to 10 percent fine and medium quartz pebbles; very strongly acid; gradual wavy boundary.

C—42 to 60 inches, stratified strong brown (7.5YR 5/8) gravelly loamy sand; single grain; loose; 20 percent rounded quartz pebbles; very strongly acid.

The solum thickness ranges from 26 to 45 inches. The content of rounded quartzose pebbles ranges from 5 to 20 percent in the solum and 5 to 30 percent in the C horizon. Reaction in unlimed areas ranges from strongly acid to extremely acid.

The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 2 to 4. The A2 horizon has hue of 10YR and value and chroma of 4 to 6. The A horizon is sandy loam or loam.

The B horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 8. The hue of 10YR is restricted to the upper part of the B horizon. The B horizon is sandy loam or sandy clay loam.

The C horizon has hue of 7.5YR or 10YR and value and chroma of 4 to 8. It is dominantly sand or loamy sand or their gravelly analogs but contains some thin strata of sandy loam in most pedons and ranges from loam to sandy clay at a depth of more than 40 inches in some pedons.

Shrewsbury Series

The Shrewsbury series consists of deep and moderately deep, poorly drained soils that formed in glauconite marine sediments. Shrewsbury soils are on flats, in broad depressions, and near the base of steeper slopes. Slope ranges from 0 to 2 percent.

Shrewsbury soils are in the landscape with Downer, Holmdel, Pemberton, and Tinton soils. The Shrewsbury soils have small amounts of glauconite, and the Downer soils do not. The Shrewsbury soils are gray in the subsurface layer, and the Holmdel, Pemberton, and Tinton soils are not.

Typical profile of Shrewsbury sandy loam, 0 to 2 percent slopes, 120 feet east of Perrineville Road and 1,050 feet north of State Highway 33, in Monroe Township:

Ap—0 to 10 inches, very dark brown (10YR 2/2) sandy loam; moderate fine and medium granular structure; friable; many fine medium roots; 5 percent glauconite; very strongly acid; abrupt smooth boundary.

A2g—10 to 19 inches, gray (10YR 6/1) sandy loam; common to many medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; common fine roots; 5 percent glauconite; very strongly acid; clear smooth boundary.

B21tg—19 to 26 inches, greenish gray (5GY 6/1) loam; common to many medium distinct brownish yellow (10YR 6/6) and strong brown (7.5YR 5/6) mottles; few fine roots; 5 percent glauconite; thick clay films line interstitial pores and root channels; very strongly acid; gradual wavy boundary.

B22tg—26 to 30 inches, greenish gray (5GY 6/1) loam; common to many medium distinct brownish yellow (10YR 6/6) and strong brown (7.5YR 5/6) mottles; few fine roots; 5 percent glauconite; moderately thick clay films line interstitial pores and root channels; very strongly acid; gradual wavy boundary.

B3—30 to 36 inches, greenish gray (5GY 5/1) loam; few fine distinct brownish yellow (10YR 6/6) mottles; massive; friable; 5 percent glauconite; very strongly acid; gradual wavy boundary.

C1—36 to 45 inches, greenish gray (5GY 5/1) loamy sand; few fine brownish yellow (10YR 6/6) mottles; single grain; loose; 3 percent glauconite; very strongly acid; gradual wavy boundary.

C2—45 to 60 inches, greenish gray (5GY 6/1) loamy sand; single grain; loose; 15 percent glauconite; very strongly acid.

The solum thickness ranges from 24 to 36 inches. The depth to bedrock is more than 5 feet. Glauconite is in at least part of all profiles. It typically comprises 5 to 15 percent of a horizon but makes up as much as 40 percent of some. The content of coarse fragments is as much as 15 percent in the solum. The coarse fragments are quartzose pebbles, fragments of iron cemented sandstone, and discontinuous crusts, sheets, or layers of iron cementation. Reaction is extremely or very strongly acid.

Unplowed sites have an A1 horizon 4 to 8 inches thick. The A horizon ranges from dark gray (10YR 4/1) to black (N 2/0). The A2 horizon ranges from light brownish gray (10YR 6/2) to gray (N 5/0) to dark gray (5Y 4/1). The content of mottles ranges from few to many. The A horizon is fine sandy loam, sandy loam, or loam.

The B horizon ranges from greenish gray (5GY 6/1) to grayish brown (2.5Y 5/2). The content of mottles is common or many. The B horizon is clay loam, sandy loam, loam, or clay loam and has a clay content from 20 percent to near 35 percent. Structure is weak or moderate. Consistence is mostly friable but ranges to firm where iron cementation is present.

The C horizon is similar to the B horizon in color. The C horizon ranges from sand to sandy loam, is single grain or massive, and generally contains glauconite.

Sulfaquents

Sulfaquents in Middlesex County consist of deep, poorly drained or very poorly drained, nearly level mineral soils that are subject to tidal flooding. The soils are on tidal flats adjacent to bays and tidal streams.

Because of the variability of these soils, a typical pedon is not given. When wet, the soils are slightly acid or neutral. When dry, they are extremely acid.

The surface layer dominantly is slightly acid and has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 2. The dominant texture is muck. The thickness of the surface layer is variable but generally is 10 to 16 inches. The substratum dominantly is neutral and has hue of 10YR or 5Y, value of 3 to 5, and chroma of 1 or 2. In some profiles dark yellowish brown mottles are in the substratum. The substratum mainly is loamy sand or sand but has some mucky lenses.

Sulfihemists

Sulfihemists in Middlesex County consist of deep, poorly drained or very poorly drained, nearly level organic soils that are subject to tidal flooding. The soils formed over stratified silty and sandy sediments of fluviomarine origin. The soils are on tidal flats adjacent to bays or tidal streams.

Because of the variability of these soils, a typical pedon is not given. When wet, the soils are slightly acid to mildly alkaline. When dry, they are extremely acid.

The surface and subsurface layers dominantly are neutral or have hue of 10YR or 2.5Y, value of 3 or 4, and chroma of 0 to 2. The upper organic layer is generally more than 20 inches thick and is muck. The mineral layers below it range from silt loam to silty clay. The depth to the sandy substratum generally is more than 51 inches.

Tinton Series

The Tinton series consists of deep, well drained soils that formed in acid Coastal Plain sediments containing medium or small amounts of glauconite. The surface layer appears to be wind deposited. Tinton soils are on divides, terraces, and side slopes. Slope ranges from 0 to 5 percent.

Tinton soils are on the landscape with Pemberton, Holmdel, and Shrewsbury soils. The Tinton soils do not have the low-chroma mottles common to the B horizon of the Pemberton and Holmdel soils or the gray color of the Shrewsbury soils.

Typical profile of Tinton loamy sand, 0 to 5 percent slopes, in Monroe Township, 1,056 feet north of the Monmouth County line and 40 feet west of Disbrow Hill Road:

Ap—0 to 18 inches, yellowish brown (10YR 5/4) loamy sand; single grain; loose; many fine roots; 1 percent glauconite; medium acid; clear smooth boundary.

A2—18 to 34 inches, yellowish brown (10YR 5/6) loamy sand; single grain; loose; common fine roots; 1 percent glauconite; strongly acid; gradual wavy boundary.

B21t—34 to 41 inches, yellowish brown (10YR 5/6) sandy loam; moderate medium subangular blocky structure; friable; few fine roots; 5 percent glauconite; moderate bridging between sand grains; strongly acid; gradual wavy boundary.

B22t—41 to 48 inches, yellowish brown (10YR 5/6) sandy loam; moderate medium and fine subangular blocky structure; friable; few fine roots; 10 percent glauconite; common moderately thick clay films lining fine interstitial pores and moderate bridging between sand grains; very strongly acid; gradual wavy boundary.

C—48 to 60 inches, yellowish brown (10YR 5/6) loamy sand; single grain; loose; 5 percent glauconite; very strongly acid.

The solum thickness ranges from 38 to 50 inches. The content of coarse fragments ranges from 0 to 15 percent in the C horizon.

The Ap horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 to 4.

The A2 horizon has hue of 10YR, value of 5 or 6, and chroma of 4 or 6. It is sand or loamy sand.

The B horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 4 to 6. It is sandy loam or sandy clay loam. The glauconite content is 5 to 20 percent.

The C horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 8. The C horizon is stratified loamy sand, sandy loam, or sand and contains glauconite.

Udorthents

Udorthents in Middlesex County consist of moderately deep to deep, well drained to somewhat poorly drained soils. They formed in stratified or graded, sandy or loamy fill material containing up to 35 percent gravel. Slope ranges from 0 to 3 percent. These soils have been disturbed in some way, mainly by filling or cutting an excessively drained to very poorly drained area.

Because of the variability of these soils, a typical pedon is not given. The filled areas are more than 20 inches deep to the original soil. The soils are strongly acid to extremely acid.

Watchung Series

The Watchung series consists of poorly drained soils that formed in acid, fine-textured material weathered from diabase and basalt rocks. The Watchung soils are on low flats south and east of Sand Hills. Slope ranges from 0 to 2 percent.

Watchung soils are on the landscape with Mount Lucas, Chalfont, Woodstown, and Manahawkin soils. The Watchung soils are similar to the Mount Lucas soils but are wetter. The Watchung soils are underlain with hard diabase or basalt bedrock; the Chalfont soils are underlain by metamorphosed shale. The Watchung soils do not have the high organic matter content common to the Manahawkin soils.

Typical profile of Watchung silt loam, in an area of Watchung very stony silt loam, 0 to 2 percent slopes, in the side of a ditch in woods on Wax and Bee Bow Range, 1,320 feet east of Major Road and 1,416 feet southeast of U.S. Highway 1, South Brunswick Township:

O2—3 inches to 0, very dark brown (10YR 2/2) partially decomposed leaves and twigs; many fine roots; 3 percent diabase stones; gradual irregular boundary.

A1—0 to 2 inches, dark brown (10YR 3/3) silt loam; weak medium granular structure; friable; many fine roots; 3 percent diabase stones; strongly acid; gradual irregular boundary.

A2g—2 to 8 inches, light gray (10YR 6/1) silt loam; few fine prominent yellowish brown (10YR 5/6) mottles; weak medium granular structure; friable; few fine and medium roots; 3 percent rounded diabase stones; medium acid; clear wavy boundary.

B21tg—8 to 18 inches, light gray (10YR 6/1) silty clay; many fine and medium prominent yellowish brown (10YR 5/6) mottles; strong medium and fine subangular blocky structure; firm; few fine and medium roots; strong continuous clay skins on ped exteriors; 5 percent rounded medium to coarse diabase stones; medium acid; gradual wavy boundary.

B22tg—18 to 27 inches, light gray (10YR 6/1) silty clay; many medium prominent yellowish brown (10YR 5/6) and brown (7.5YR 4/4) mottles; strong fine and medium subangular blocky structure; firm; few fine and medium roots; strong continuous clay films on ped exteriors; 5 percent rounded medium to coarse diabase stone; medium acid.

C1—27 to 37 inches, brown (7.5YR 5/4) loam; massive; firm; sandy loam cemented in places; 10 percent subrounded cobblestones and stones; medium acid; diffuse broken boundary.

C2—37 to 60 inches, strong brown (7.5YR 5/6) loam; common to many medium prominent light gray (10YR 6/1) mottles and common to many medium distinct brown (7.5YR 5/4) mottles; massive; loose; 15 percent subrounded cobblestones and stones; medium acid.

The solum thickness ranges from 28 to 40 inches. The content of coarse fragments ranges from 0 to 2 percent throughout the solum and from 10 to 50 percent in the C horizon. These coarse fragments are principally diabase and basalt (trap) stones and boulders. Reaction of the soil ranges from strongly acid to neutral.

The A1 horizon has hue of 10YR, value of 3 or 4, chroma of 2 or 3. The A2 horizon has hue of 10YR, value of 5 or 6, and chroma of 1 or 2.

The B horizon is neutral or has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 0 to 2. It is silty clay, clay loam, silty clay loam, or clay. Consistence is firm or very firm.

The C horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 1 to 6. In some pedons part of the horizon is disintegrated trap rock.

Woodstown Series

The Woodstown series consists of deep, moderately well drained soils that formed in acid, moderately fine textured Coastal Plain sediments. The Woodstown soils are on intermediate positions, on terraces, and on toeslopes. Slope ranges from 0 to 5 percent.

Woodstown soils are on the landscape with Sassafras, Fallsington, Downer, and Hammonton soils. The Bt horizon in the Sassafras and Downer soils is not mottled, the Bt horizon in the Fallsington soils is gray, and the Bt horizon in the Downer and Hammonton soils contains less clay than that in the Woodstown soils.

Typical profile of Woodstown sandy loam, 2 to 5 percent slopes, in a cultivated field 50 feet northeast of Davidson's Mill Road, 6,000 feet west of U.S. Route 1, in South Brunswick Township:

Ap—0 to 8 inches, dark grayish brown (2.5Y 4/2) sandy loam; moderate fine granular structure; very friable; many fine roots; very strongly acid; abrupt smooth boundary.

A2—8 to 12 inches, yellowish brown (10YR 5/4) sandy loam; moderate medium granular structure; friable; few fine roots; very strongly acid; abrupt smooth boundary.

B1t—12 to 18 inches, yellowish brown (10YR 5/6) sandy clay loam; moderate medium subangular blocky structure; friable; few fine roots; many thin clay films on faces of peds; very strongly acid; gradual irregular boundary.

B21t—18 to 22 inches, yellowish brown (10YR 5/6) sandy clay loam; few fine distinct light gray (2.5Y 7/2) and yellowish brown (10YR 5/8) mottles; strong fine and medium subangular blocky structure; firm; few fine roots; many thin clay films on faces of peds; very strongly acid; gradual irregular boundary.

B22t—22 to 25 inches, yellowish brown (10YR 5/8) sandy clay loam; common medium prominent light gray (2.5Y 7/2) mottles; weak fine and medium subangular blocky structure; friable; few thin clay films on faces of peds; about 5 percent pebbles; very strongly acid; gradual wavy boundary.

B3—25 to 36 inches, yellowish brown (10YR 5/6) sandy loam; common medium and coarse distinct mottles; weak medium subangular blocky structure; very friable; very strongly acid; gradual wavy boundary.

IIC—36 to 60 inches, stratified yellowish brown (10YR 5/6) loamy sand; single grain; loose; 3 percent quartzose pebbles; very strongly acid; abrupt smooth boundary.

The solum thickness ranges from 24 to 38 inches. The content of rounded quartzose pebbles ranges from 0 to 10 percent in the solum and from 0 to 20 percent in the C horizon. Reaction in unlimed areas ranges from extremely acid to strongly acid.

The A horizon has hue of 2.5Y or 10YR, value of 4 to 6, and chroma of 2 to 4. It is sandy loam or loam.

The B horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 4 to 8. Mottling ranges from few to many, fine to coarse, and faint to prominent. Consistence is friable or firm. The B horizon is sandy clay loam or sandy loam.

The C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 6. It dominantly is loamy sand or gravelly loamy sand and generally contains thin strata of sandy loam. In some pedons the texture below a depth of 40 inches is sandy loam or sandy clay loam.

Formation of the Soils

This section describes the five factors of soil formation as they relate to the soils in Middlesex County, gives the differences and similarities of the soils, and explains the process of soil formation. The relationship between the soils and their parent material, drainage, and texture of the subsoil is shown in table 18.

Factors of Soil Formation

Soils are formed by weathering and other processes that act on the parent material. The properties of the soil at any point on the earth depend on the combination of the following factors: physical and chemical composition of the parent material, climate, plant and animal life, relief, and time. These factors are so closely related that few generalizations can be made about the effects of one. The relative influence of each factor differs from place to place, and each modifies the effect of the other four. For example, the effects of climate and plant and animal life are influenced by relief and by the nature of the parent material. In places the influence of one factor is dominant.

Parent Material

Parent material is the unconsolidated mass from which a soil is formed. In the early stage of soil development, properties inherited from parent material are most evident. Later these properties are modified, and the soil acquires characteristics of its own, but the kind of parent material determines the texture and mineral composition of the soil.

Middlesex County is in two major physiographic provinces: the Piedmont and the Coastal Plain. The Piedmont is west of a line connecting Avenel, Milltown, Monmouth, Monmouth Junction, and Princeton. Almost all the soils in the Piedmont formed in material underlain by red shale bedrock. These are the Klinesville, Reaville, Reaville Variant, Lansdowne, and Penns soils and Udorthents, bedrock substratum. The Klinesville, Penn, Reaville, and Reaville Variant soils and the Udorthents, bedrock substratum, are shallow or moderately deep to shale. The Lansdowne soils are deep to shale.

During the Triassic age, diabase dikes were formed in the red shale by molten rock from the interior of the earth. These dikes cooled slowly and became very hard and were exposed by later erosion of the red shale. Weathering of the diabase and basalt rocks in these dikes has produced the Mount Lucas and Watchung soils. The heat from these igneous intrusions baked the adjoining red shale and changed it chemically and physically. This metamorphosed rock became more gray. The soils that developed from it, Chalfont soils, have different characteristics than those that developed from the red shale bedrock.

During the last glacial period, the Wisconsin age, the ice sheet flowed as far south as Metuchen and Perth Amboy. The ice sheet pushed earth and rock ahead of it. As the meltwaters poured from the glacier they carried gravel, sand, silt, and clay with them. This material is called glacial outwash or glacial drift. It is in the valleys between the high ground of the Piedmont in Piscataway Township and the Watchung Mountains. Dunellen, Dunellen Variant, Ellington Variant, Parsippany (frequently flooded), Parsippany Variant, and Rowland soils formed in the glacial outwash north of the Raritan River. The outwash is believed to have been carried as far as North Brunswick Township and around Little Rocky Hill to the vicinity of Kingston in South Brunswick Township. When the ice melted it left a moraine 160 to 200 feet high and 2 to 2.5 miles wide. The Boonton, Haledon, and Haledon Variant soils formed when this ice sheet receded.

East of the Piedmont is the Coastal Plain. The Coastal Plain is composed of beds of Cretaceous, Tertiary, or Quaternary age. All were water deposited. Cretaceous soils are oldest, are deepest, and have a high percentage of clay. Keyport and Elkton soils formed in them. Pemberton, Shrewsbury, and Tinton soils are of the same age but are sandy and contain small amounts of greensand of glauconite.

The Quaternary beds are surficial in most of the Coastal Plain. These are the youngest. They have been divided into two types; those with gravel (Pennsauken) and those that are very sandy (Cape May).

Fragipans are genetically developed layers within the soil. They curtail or restrict the movement of moisture and rooting depth. Fragipans are difficult to excavate, and they mainly develop in well graded soil material.

The Cape May deposits are east of Old Bridge, Spotswood, and Helmetta and are in the Matchponix Brook Valley all the way south to Jamesburg. These sand deposits are believed to be sediments from ice which filled the Matchapanix Brook Valley when the gravelly materials were being deposited. The gravelly

deposits (Pennsauken) are stratified and quite uniform from the Raritan River south to Pennsauken, where they were first described.

Matapeake, Mattapex, Downer, Sassafras, Hammonton, Holmdel, Fallsington, Mullica, and Woodstown soils developed in these Pennsauken materials. The Holmdel soils contain small amounts of greensand, but the others do not contain any.

Atsion, Evesboro, Fort Mott, Klej, Lakehurst, and Manahawkin soils and Sulfaquents and Sulfihemists and Humaquepts (frequently flooded) formed in the recent Cape May materials.

Klej clayey substratum, Hammonton clayey substratum, and Woodstown clayey substratum soils are predominantly Coastal Plain (Quaternary age) soils overlying Coastal Plain materials of Cretaceous age.

Nixon, Nixon Variant, Fallsington Variant, and Lansdowne soils formed in Quarternary Coastal Plain material overlying Triassic red shale bedrock. Although of Coastal Plain origin, these soils contain red shale fragments. Cretaceous Coastal Plain material underlies the Wisconsin terminal moraine east of Avenel.

Two small areas of Quarternary Elkton soil also overlie Triassic red shale bedrock in North Brunswick Township.

There is no gravel in the soils east of Old Bridge, Spotswood, and Helmetta or as far south as Jamesburg. There is also an abrupt drop in elevation at these four areas. It is believed that this valley was filled with ice during and for a while following the Wisconsin ice age and that the ice precluded the filling of the valleys with Quarternary material.

Time

The time required for a soil to form depends on the other soil-forming factors. Less time is required for a soil to form in a warm, moist climate than in a cool, dry climate. Some parent material is more resistant to the soil-forming processes than others. For example, quartz sand may change very little, even if it is exposed for centuries. The age of a soil is measured by the degree of profile development, rather than by the number of years the soil has been in the process of forming. When soils begin to form in recently deposited material, they have characteristics almost identical to those of the parent material. Such soils are said to be immature. Among the immature soils in Middlesex County are the Humaquepts, frequently flooded. These soils are on flood plains where alluvium still accumulates. They have indistinct soil horizons and little other evidence of soil development. Steep soils, like those of the Klinesville series, do not have well defined profiles because erosion removes soil almost as fast as it forms.

A soil is generally said to be mature when it has acquired a well developed profile. Examples of mature soils in Middlesex County are the Downer and Sassafras soils. These soils are deep to bedrock and have distinct horizons, and the soil aggregates in them have a definite pattern of arrangement.

Relief

Relief influences soil formation through its influence on drainage, erosion, plant cover, and soil temperature. Relief varies widely and accounts for many differences in the soils of Middlesex County. The Humaquepts, frequently flooded, have developed recently, largely as a result of runoff from Keyport soils along the eastern edge of the county. Many of the soils will have mottling in the subsoil. This is generally produced by alternate wetting and drying of the layers in the soil as the water table rises and falls. The red colors are the result of the presence of iron released by oxidation. Gray colors are characteristic of a lack of oxidation as a result of wetness. Elkton soils are an example of soils that are wet much of the time.

Gently sloping soils commonly show more clearly the influence of all soil-forming factors. Excess water runs off without excessive erosion, and a soil profile is developed. Downer, Hammonton, Sassafras, Woodstown, and Fallsington soils are examples. Some steep soils are shallow and show slight development because geologic erosion proceeds almost as fast as the formation of parent material and soil development. Keyport loam, 10 to 15 percent slopes, is an example. Soil temperature and plant cover differ on north-facing slopes as compared to south-facing slopes, sometimes resulting in more erosion on south-facing slopes.

Plant and Animal Life

Most of the soils in the northern part of the county formed under hardwood forests. Those in the southern part formed under an oak-pine forest and have a layer of loose leaves, branches, and twigs and a thin, dark layer above the surface layer. When these were plowed, the leaves, twigs and organic layer were mixed with the lighter-colored layer below it. This produced a slightly darker plow layer. The organic matter content in most cultivated soils stabilizes at less than 3 percent because of the high oxidation rate. Nevertheless, crop residue, plowing under of cover crops, and animal manure are recommended because of the beneficial effects these sources of organic matter and nutrients have on the soil structure and fertility.

Earthworms, insects, and other small animals mix soil material and add organic matter. Bacteria, fungi, and other micro-organisms break down plant and animal residues. Trees and other plants bring plant nutrients from the lower part of the solum to the upper layers, add organic matter, and form a protective cover that retards the erosion process and influences soil temperature. Channeling by roots and the uprooting of trees also mixes soil material.

The organic matter added by plants and animals alters the chemical processes in the soil and results in the formation of humus.

Changes in the soils in Middlesex County caused by man are more noticeable in soils that have been eroded, drained, excavated, or filled. Cultivation, drainage, irrigation, fertilization, the introduction of new plants, and major land forming operations influence soil development by changing the nature and properties of the soils. Most of these changes, except for major land forming, are slow.

Climate

Climate affects the physical, chemical, and biological properties of a soil, doing so mostly through the influence of rainfall and temperature. Water supports biological activity. It dissolves and transports minerals and organic residues down through the soil profile, and it influences the weathering of rocks and minerals and the removal and deposition of material. The amount of water that moves through the soil is determined by the amount of rainfall, the relative humidity, the temperature, the degree of slope, the rate of infiltration, and the permeability of the soil. Temperature influences the kinds and amounts of plants, the kinds of animals and their activities, and the rate of chemical and physical processes that are part of weathering and soil formation.

The soils in Middlesex County formed in a temperate, moist climate that probably was not greatly different from that of the present. Winters are fairly short, and there are only short periods when the temperature is extremely low. Summer periods of high temperature are fairly short. The average annual temperature is about 53 degrees. The average annual precipitation is about 45 inches. Precipitation is fairly evenly distributed throughout the year.

Temperature and rainfall have been favorable for the almost continuous weathering of rocks and minerals, for the leaching of soluble materials and fine particles, and for the removal and deposition of materials by water. Soluble bases, such as calcium and magnesium, and clay minerals have been moved into the lower horizons or out of the soils altogether.

Nearly all the soils of the county were water deposited, and most of the soluble bases were already dissolved and washed away before deposition. The high rainfall has further removed what bases there were so that nearly all soils have a pH of 4 to 5 in their natural condition. Those soils developed in glacial till (Boonton and Haledon soils) have large amounts of carbonates, and, with weathering, these carbonates have moved downward into the subsoil and substratum or out of the soil.

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Glossary

ABC soil. A soil having an A, a B, and a C horizon.

Ablation till. Loose, permeable till deposited during the final downwasting of glacial ice. Lenses of crudely sorted sand and gravel are common.

AC soil. A soil having only an A and a C horizon. Commonly such soil formed in recent alluvium or on steep rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali (sodic) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher), or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 2.4
Low	2.4 to 3.2
Moderate	3.2 to 5.2
High	more than 5.2

Basal till. Compact glacial till deposited beneath the ice.

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Bedding planes. Fine stratifications, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediments.

Bedding system. A drainage system made by plowing, grading, or otherwise shaping the surface of a flat field. It consists of a series of low ridges separated by shallow, parallel dead furrows.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on the contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Blowout. A shallow depression from which all or most of the soil material has been removed by wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of pebbles or cobbles. In some blowouts the water table is exposed.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Broad-base terrace. A ridge-type terrace built to control erosion by diverting runoff along the contour at a nonscouring velocity. The terrace is 10 to 20 inches high and 15 to 30 feet wide and has gently sloping sides, a rounded crown, and a dish-shaped channel along the upper side. It may be nearly level or have a grade toward one or both ends.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Caliche. A more or less cemented deposit of calcium carbonate in soils of warm-temperate, subhumid to arid areas. Caliche occurs as soft, thin layers in the soil or as hard, thick beds just beneath the solum, or it is exposed at the surface by erosion.

California bearing ratio (CBR). The load-supporting capacity of a soil as compared to that of a standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed limestone, per unit area, with the same degree of distortion.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena. A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Catsteps. Very small, irregular terraces on steep hillsides, especially in pasture, formed by the trampling of cattle or the slippage of saturated soil.

Cement rock. Shaly limestone used in the manufacture of cement.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a channer.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Climax vegetation. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Compressible (in tables). Excessive decrease in volume of soft soil under load.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Congeliturbate. Soil material disturbed by frost action.

Conservation tillage. A tillage and planting system in which crop residue covers at least 30 percent of the soil surface after planting. Where soil erosion by wind is the main concern, the system leaves the equivalent of at least 1,000 pounds per acre of flat small-grain residue on the surface during the critical erosion period.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Coprogenous earth (sedimentary peat). Fecal material deposited in water by aquatic organisms.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Drumlin. A low, smooth, elongated oval hill, mound, or ridge of compact glacial till. The longer axis is parallel to the path of the glacier and commonly has a blunt nose pointing in the direction from which the ice approached.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.
Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.
Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Erosion pavement. A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

Esker (geology). A narrow, winding ridge of stratified gravelly and sandy drift deposited by a stream flowing in a tunnel beneath a glacier.

Excess alkali (in tables). Excess exchangeable sodium in the soil. The resulting poor physical properties restrict the growth of plants.

Excess fines (in tables). Excess silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

Excess lime (in tables). Excess carbonates in the soil that restrict the growth of some plants.

Excess salts (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

Excess sulfur (in tables). Excessive amount of sulfur in the soil. The sulfur causes extreme acidity if the soil is drained, and the growth of most plants is restricted.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grains are grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, and clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist, 6 to 15 inches (15 to 38 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Fragile (in tables). A soil that is easily damaged by use or disturbance.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gilgai. Commonly a succession of microbasins and microknolls in nearly level areas or of microvalleys and microridges parallel with the slope. Typically, the microrelief of Vertisols—clayey soils having a high coefficient of expansion and contraction with changes in moisture content.

Glacial drift (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial melt water.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciofluvial deposits (geology). Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial melt water. Many deposits are interbedded or laminated.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Graded stripcropping. Growing crops in strips that grade toward a protected waterway.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric and the more decomposed sapric material.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, any plowed or disturbed surface layer.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) granular, prismatic, or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Hard, consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be

limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake in inches per hour is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, invader plants follow disturbance of the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Kame (geology). An irregular, short ridge or hill of stratified glacial drift.

Karst (topography). The relief of an area underlain by limestone that dissolves in differing degrees, thus forming numerous depressions or small basins.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Moraine (geology). An accumulation of earth, stones, and other debris deposited by a glacier. Some types are terminal, lateral, medial, and ground.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Muck. Dark colored, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Narrow-base terrace. A terrace no more than 4 to 8 feet wide at the base. A narrow-base terrace is similar to a broad-base terrace, except for the width of the ridge and channel.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Outwash, glacial. Stratified sand and gravel produced by glaciers and carried, sorted, and deposited by glacial melt water.

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan*.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material).

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permafrost. Layers of soil, or even bedrock, occurring in arctic or subarctic regions, in which a temperture below freezing has existed continuously for a long time.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Pitting (in tables). Pits caused by melting ground ice. They form on the soil after plant cover is removed.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plinthite. The sesquioxide-rich, humus-poor, highly weathered mixture of clay with quartz and other diluents. It commonly appears as red mottles, usually in platy, polygonal, or reticulate patterns. Plinthite changes irreversibly to an ironstone hardpan or to irregular aggregates on repeated wetting and drying, especially if it is exposed also to heat from the sun. In a moist soil, plinthite can be cut with a spade. It is a form of laterite.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor filter (in tables). Because of rapid permeability the soil may not adequately filter effluent from a waste disposal system.

Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or

browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor, on the basis of how much the present plant community has departed from the potential.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rippable. Bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 draw bar horsepower rating.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Salty water (in tables.) Water that is too salty for consumption by livestock.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Much has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saprolite (soil science). Unconsolidated residual material underlying the soil and grading to hard bedrock below.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silica-sesquioxide ratio. The ratio of the number of molecules of silica to the number of molecules of alumina and iron oxide. The more highly weathered soils or their clay fractions in warm-temperate, humid regions, and especially those in the tropics, generally have a low ratio.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slick spot. A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil is generally silty or clayey, is slippery when wet, and is low in productivity.

Slippage (in tables). Soil mass susceptible to movement downslope when loaded, excavated, or wet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multipled by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Sloughed till. Water-saturated till that has flowed slowly downhill from its original place of deposit by glacial ice. It may rest on other till, on glacial outwash, or on a glaciolacustrine deposit.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Sodicity. The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of Na^+ to $Ca^{++} + Mg^{++}$. The degrees of sodicity are—

	SAR
Slight	less than 13:1
Moderate	13-30:1
Strong	more than 30:1

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stone line. A concentration of coarse fragments in a soil. Generally it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular. Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period the the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Breaking up a compact subsoil by pulling a special chisel through the soil.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from about 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons. It includes all subdivisions of these horizons.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifiying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Till plain. An extensive flat to undulating area underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Too arid (in tables). The soil is dry most of the time, and vegetation is difficult to establish.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Toxicity (in tables). Excessive amount of toxic substances, such as sodium or sulfur, that severely hinder establishment of vegetation or severely restrict plant growth.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, are in soils in extremely small amounts. They are essential to plant growth.

Tuff. A compacted deposit that is 50 percent or more volcanic ash and dust.

Unstable fill (in tables). Risk of caving or sloughing on banks of fill material.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial melt water. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Varve. A sedimentary layer of a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by melt water streams, in glacial lake or other body of still water in front of a glacier.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Recorded in the period 1951-80 at New Brunswick, N.J.]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days*	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	39.1	22.7	30.9	63	0	22	3.04	1.82	4.13	7	6.2
February---	41.4	24.1	32.7	64	2	19	3.08	2.00	4.04	7	7.8
March------	49.6	30.8	40.2	76	13	92	3.92	2.77	4.98	7	4.7
April------	62.0	40.4	51.2	86	24	339	3.76	2.32	5.04	8	.5
May--------	72.1	49.6	60.9	91	34	648	3.75	2.00	5.18	8	.0
June-------	80.8	59.1	70.0	96	45	900	3.32	1.59	4.72	7	.0
July-------	85.4	64.2	74.8	97	52	1,097	4.50	2.04	6.49	7	.0
August-----	83.5	62.8	73.2	94	49	1,029	4.99	2.41	7.09	7	.0
September--	77.2	55.7	66.5	93	37	795	4.00	1.74	5.82	6	.0
October----	66.9	45.0	56.0	84	26	496	3.23	1.61	4.55	5	.1
November---	54.4	36.3	45.4	75	18	178	3.89	2.26	5.22	7	.5
December---	42.7	26.7	34.7	66	6	50	3.91	1.92	5.53	7	4.9
Year:											
Average---	62.9	43.1	53.0	---	---	---	---	---	---	---	---
Extreme---	---	---	---	99	-2	---	---	---	---	---	---
Total-----	---	---	---	---	---	5,647	45.39	38.58	51.92	83	24.7

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Recorded in the period 1951-75 at New Brunswick, N. J.]

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	April 6	April 17	May 2
2 years in 10 later than--	April 1	April 13	April 27
5 years in 10 later than--	March 22	April 7	April 17
First freezing temperature in fall:			
1 year in 10 earlier than--	November 8	October 20	October 10
2 years in 10 earlier than--	November 13	October 25	October 14
5 years in 10 earlier than--	November 21	November 4	October 24

TABLE 3.--GROWING SEASON

[Recorded in the period 1951-75 at New Brunswick, N.J.]

Probability	Length of growing season if daily minimum temperature is--		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	225	191	166
8 years in 10	231	198	174
5 years in 10	243	210	189
2 years in 10	255	223	204
1 year in 10	261	229	212

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
At	Atsion sand	4,700	2.3
BoB	Boonton loam, 2 to 5 percent slopes	2,850	1.4
BoC	Boonton loam, 5 to 10 percent slopes	830	0.4
BoD	Boonton loam, 10 to 15 percent slopes	240	0.1
BUB	Boonton-Urban land complex, 0 to 5 percent slopes	10,000	5.0
ChA	Chalfont silt loam, 0 to 2 percent slopes	370	0.2
ChB	Chalfont silt loam, 2 to 5 percent slopes	400	0.2
DnA	Downer loamy sand, 0 to 5 percent slopes	2,350	1.2
DnC	Downer loamy sand, 5 to 10 percent slopes	670	0.3
DoB	Downer sandy loam, 2 to 5 percent slopes	380	0.2
DTB	Downer-Urban land complex, 0 to 10 percent slopes	4,200	2.1
DTD	Downer-Urban land complex, 10 to 15 percent slopes	270	0.1
DUA	Dunellen-Urban land complex, 0 to 5 percent slopes	3,450	1.7
DvA	Dunellen Variant sandy loam, 0 to 2 percent slopes	1,000	0.5
DvB	Dunellen Variant sandy loam, 2 to 5 percent slopes	280	0.1
DWA	Dunellen Variant-Urban land complex, 0 to 5 percent slopes	1,900	1.0
Ek	Elkton loam	4,050	2.0
EoA	Ellington Variant sandy loam, 0 to 2 percent slopes	300	0.2
EoB	Ellington Variant sandy loam, 2 to 5 percent slopes	470	0.2
ESA	Ellington Variant-Urban land complex, 0 to 5 percent slopes	1,750	0.9
EvB	Evesboro sand, 0 to 5 percent slopes	2,950	1.5
EvC	Evesboro sand, 5 to 10 percent slopes	270	0.1
EvD	Evesboro sand, 10 to 15 percent slopes	520	0.3
Fa	Fallsington sandy loam	1,250	0.6
Fb	Fallsington loam	5,750	2.9
Fd	Fallsington Variant loam	1,190	0.6
FrB	Fort Mott loamy sand, 0 to 5 percent slopes	1,050	0.5
HaA	Haledon silt loam, 0 to 2 percent slopes	1,400	0.7
HaB	Haledon silt loam, 2 to 5 percent slopes	880	0.4
HBB	Haledon-Urban land complex, 0 to 5 percent slopes	3,300	1.6
HcA	Haledon Variant silt loam, 0 to 2 percent slopes	570	0.3
HeA	Hammonton loamy sand, 0 to 3 percent slopes	1,100	0.6
HlA	Hammonton loamy sand, clayey substratum, 0 to 3 percent slopes	780	0.4
HmA	Hammonton sandy loam, 0 to 2 percent slopes	360	0.2
HoA	Holmdel fine sandy loam, 0 to 2 percent slopes	900	0.5
HU	Humaquepts, frequently flooded	3,250	1.6
KeA	Keyport sandy loam, 0 to 2 percent slopes	1,150	0.6
KeB	Keyport sandy loam, 2 to 5 percent slopes	1,800	0.9
KeD	Keyport sandy loam, 10 to 15 percent slopes	330	0.2
KfA	Keyport loam, 0 to 2 percent slopes	1,500	0.8
KfB	Keyport loam, 2 to 5 percent slopes	2,150	1.1
KfC	Keyport loam, 5 to 10 percent slopes	560	0.3
KfD	Keyport loam, 10 to 15 percent slopes	750	0.4
KGB	Keyport-Urban land complex, 0 to 10 percent slopes	1,100	0.6
KlA	Klej loamy sand, 0 to 3 percent slopes	3,400	1.7
KmA	Klej loamy sand, clayey substratum, 0 to 3 percent slopes	2,600	1.3
KUA	Klej clayey substratum-Urban land complex, 0 to 5 percent slopes	1,600	0.8
KvB	Klinesville shaly loam, 0 to 5 percent slopes	3,450	1.7
KvD	Klinesville shaly loam, 5 to 15 percent slopes	340	0.2
KvE	Klinesville shaly loam, 15 to 25 percent slopes	480	0.2
KWB	Klinesville-Urban land complex, 0 to 5 percent slopes	5,700	2.9
LaA	Lakehurst sand, 0 to 3 percent slopes	1,200	0.6
LeB	Lakewood sand, 2 to 8 percent slopes	350	0.2
LnA	Lansdowne silt loam, 0 to 2 percent slopes	830	0.4
LnB	Lansdowne silt loam, 2 to 5 percent slopes	550	0.3
LUA	Lansdowne-Urban land complex, 0 to 5 percent slopes	1,500	0.8
LvA	Lansdowne Variant silt loam, 0 to 2 percent slopes	560	0.3
Ma	Manahawkin muck	2,250	1.1
MeA	Matapeake silt loam, 0 to 2 percent slopes	2,100	1.1
MeB	Matapeake silt loam, 2 to 5 percent slopes	1,020	0.5
MgA	Mattapex silt loam, 0 to 2 percent slopes	890	0.4
MgB	Mattapex silt loam, 2 to 5 percent slopes	730	0.4
MoA	Mount Lucas silt loam, 0 to 2 percent slopes	570	0.3
MoB	Mount Lucas silt loam, 2 to 5 percent slopes	440	0.2
MsB	Mount Lucas very stony silt loam, 0 to 5 percent slopes	1,050	0.5

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
Mu	Mullica sandy loam	1,250	0.6
NaA	Nixon loam, 0 to 2 percent slopes	1,110	0.6
NaB	Nixon loam, 2 to 5 percent slopes	1,210	0.6
NCB	Nixon-Urban land complex, 0 to 5 percent slopes	2,270	1.1
NfA	Nixon Variant loam, 0 to 2 percent slopes	2,050	1.0
NfB	Nixon Variant loam, 2 to 5 percent slopes	390	0.2
NGA	Nixon Variant-Urban land complex, 0 to 5 percent slopes	1,350	0.7
Pa	Parsippany silt loam	990	0.5
Pb	Parsippany silt loam, frequently flooded	230	0.1
Pc	Parsippany Variant silt loam	1,250	0.6
PeA	Pemberton loamy sand, 0 to 3 percent slopes	460	0.2
PfA	Penn silt loam, 0 to 2 percent slopes	330	0.2
PfB	Penn silt loam, 2 to 5 percent slopes	280	0.1
PhD	Phalanx loamy sand, 2 to 15 percent slopes	290	0.1
PL	Pits, clay	1,700	0.8
PM	Pits, sand and gravel	3,000	1.5
PN	Psamments, nearly level	3,150	1.6
PO	Psamments, sulfidic substratum	1,300	0.6
PW	Psamments, waste substratum	1,250	0.6
ReA	Reaville silt loam, 0 to 2 percent slopes	1,450	0.7
ReB	Reaville silt loam, 2 to 5 percent slopes	510	0.3
RFA	Reaville-Urban land complex, 0 to 5 percent slopes	1,400	0.7
Rh	Reaville Variant silt loam	800	0.4
Ro	Rowland silt loam	1,850	0.9
SaA	Sassafras sandy loam, 0 to 2 percent slopes	390	0.2
SaB	Sassafras sandy loam, 2 to 5 percent slopes	7,040	3.5
SaC	Sassafras sandy loam, 5 to 10 percent slopes	2,150	1.1
SgB	Sassafras gravelly sandy loam, 2 to 5 percent slopes	990	0.5
SgC	Sassafras gravelly sandy loam, 5 to 10 percent slopes	790	0.4
SgD	Sassafras gravelly sandy loam, 10 to 15 percent slopes	1,100	0.6
SlA	Sassafras loam, 0 to 2 percent slopes	2,990	1.5
SlB	Sassafras loam, 2 to 5 percent slopes	4,970	2.5
SMB	Sassafras-Urban land complex, 0 to 5 percent slopes	4,180	2.1
SrA	Shrewsbury sandy loam, 0 to 2 percent slopes	1,200	0.6
SU	Sulfaquents and Sulfihemists, frequently flooded	5,250	2.6
TnB	Tinton loamy sand, 0 to 5 percent slopes	310	0.2
UB	Udorthents, bedrock substratum	300	0.2
UC	Udorthents, clayey substratum	990	0.5
UD	Udorthents, wet substratum-urban land complex	350	0.2
UL	Urban land	12,420	6.2
Wa	Watchung very stony silt loam, 0 to 2 percent slopes	750	0.4
WdA	Woodstown sandy loam, 0 to 2 percent slopes	2,640	1.3
WdB	Woodstown sandy loam, 2 to 5 percent slopes	3,430	1.7
WkA	Woodstown sandy loam, clayey substratum, 0 to 2 percent slopes	430	0.2
WkB	Woodstown sandy loam, clayey substratum, 2 to 5 percent slopes	670	0.3
WlA	Woodstown loam, 0 to 2 percent slopes	5,970	3.0
WlB	Woodstown loam, 2 to 5 percent slopes	1,370	0.7
WU	Woodstown-Urban land complex, 0 to 5 percent slopes	500	0.3
	Water	1,700	0.8
	Total	199,680	100.0

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE

(Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Soil name and map symbol	Soybeans	Corn	Wheat	Alfalfa hay	Tomatoes
	Bu	Bu	Bu	Tons	Tons
At---------- Atsion	---	---	---	---	---
BoB, BoC---------- Boonton	---	110	35	3.5	18
BoD---------- Boonton	---	100	30	3.0	---
BUB*---------- Boonton-Urban land	---	---	---	---	---
ChA---------- Chalfont	30	95	---	---	---
ChB---------- Chalfont	30	95	---	---	---
DnA---------- Downer	25	90	35	3.0	17
DnC---------- Downer	20	80	30	2.5	16
DoB---------- Downer	35	100	40	3.5	18
DTB*---------- Downer-Urban land	---	---	---	---	---
DTD*---------- Downer-Urban land	---	---	---	---	---
DUA*---------- Dunellen-Urban land	---	---	---	---	---
DvA, DvB---------- Dunellen Variant	---	---	---	---	---
DWA*---------- Dunellen Variant-Urban land	---	---	---	---	---
Ek---------- Elkton	40	105	---	---	---
EoA, EoB---------- Ellington Variant	30	120	40	3.5	22
ESA*---------- Ellington Variant-Urban land	---	---	---	---	---
EvB, EvC, EvD---------- Evesboro	---	---	---	---	---

See footnote at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Soybeans	Corn	Wheat	Alfalfa hay	Tomatoes
	Bu	Bu	Bu	Tons	Tons
Fa, Fb---------- Fallsington	35	120	---	---	---
Fd---------- Fallsington Variant	30	90	---	---	---
FrB---------- Fort Mott	20	80	---	2.8	12
HaA---------- Haledon	---	100	---	---	---
HaB---------- Haledon	---	100	---	---	---
HBB*---------- Haledon-Urban land	---	---	---	---	---
HcA---------- Haledon Variant	---	90	---	2.5	---
HeA, HlA---------- Hammonton	30	90	35	3.0	---
HmA---------- Hammonton	35	100	35	3.0	---
HoA---------- Holmdel	---	---	---	---	---
HU*. Humaquepts					
KeA---------- Keyport	50	110	40	3.5	16
KeB---------- Keyport	50	105	40	3.5	16
KeD---------- Keyport	35	---	---	---	---
KfA---------- Keyport	50	110	40	3.5	16
KfB---------- Keyport	50	105	40	3.5	16
KfC---------- Keyport	45	100	40	3.5	16
KfD---------- Keyport	35	---	---	---	---
KGB*---------- Keyport-Urban land	---	---	---	---	---
KlA, KmA---------- Klej	20	80	---	---	---

See footnote at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Soybeans	Corn	Wheat	Alfalfa hay	Tomatoes
	Bu	Bu	Bu	Tons	Tons
KUA*-- Klej clayey substratum-Urban land	---	---	---	---	---
KvB-- Klinesville	---	60	25	2.5	12
KvD-- Klinesville	---	---	20	2.5	---
KvE-- Klinesville	---	---	---	---	---
KWB*-- Klinesville-Urban land	---	---	---	---	---
LaA-- Lakehurst	---	---	---	---	---
LeB-- Lakewood	---	---	---	---	---
LnA-- Lansdowne	35	100	40	3.5	16
LnB-- Lansdowne	35	100	40	3.5	16
LUA*-- Lansdowne-Urban land	---	---	---	---	---
LvA-- Lansdowne Variant	35	100	40	3.5	16
Ma-- Manahawkin	---	---	---	---	---
MeA-- Matapeake	45	140	50	5.5	22
MeB-- Matapeake	45	140	50	5.5	22
MgA-- Mattapex	40	135	50	5.5	22
MgB-- Mattapex	40	135	45	5.5	22
MoA-- Mount Lucas	---	105	45	4.0	16
MoB-- Mount Lucas	---	105	45	4.0	16
MsB-- Mount Lucas	---	---	---	---	---
Mu-- Mullica	---	---	---	---	---

See footnote at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Soybeans	Corn	Wheat	Alfalfa hay	Tomatoes
	Bu	Bu	Bu	Tons	Tons
NaA---------- Nixon	45	130	50	5.5	22
NaB---------- Nixon	45	130	50	5.5	22
NCB*---------- Nixon-Urban land	---	---	---	---	---
NfA---------- Nixon Variant	40	120	45	4.5	20
NfB---------- Nixon Variant	40	120	45	4.5	20
NGA*---------- Nixon Variant-Urban land	---	---	---	---	---
Pa---------- Parsippany	---	---	---	---	---
Pb---------- Parsippany	---	---	---	---	---
Pc---------- Parsippany Variant	---	---	---	---	---
PeA---------- Pemberton	30	70	35	3.5	16
PfA---------- Penn	35	95	40	3.5	18
PfB---------- Penn	35	95	40	3.5	18
PhD---------- Phalanx	---	---	---	---	---
PL*, PM*. Pits					
PN*, PO*, PW*. Psamments					
ReA---------- Reaville	25	75	---	---	---
ReB---------- Reaville	25	75	---	---	---
RFA*---------- Reaville-Urban land	---	---	---	---	---
Rh---------- Reaville Variant	---	70	---	---	---
Ro---------- Rowland	---	130	45	4.5	---

See footnote at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Soybeans	Corn	Wheat	Alfalfa hay	Tomatoes
	Bu	Bu	Bu	Tons	Tons
SaA---------- Sassafras	45	130	50	5.0	22
SaB---------- Sassafras	45	130	50	5.0	22
SaC---------- Sassafras	40	120	45	4.5	20
SgB---------- Sassafras	45	130	50	5.0	22
SgC---------- Sassafras	40	120	45	4.5	20
SgD. Sassafras					
SlA---------- Sassafras	45	130	50	5.0	22
SlB---------- Sassafras	45	130	50	5.0	22
SMB*---------- Sassafras-Urban land	---	---	---	---	---
SrA. Shrewsbury					
SU*---------- Sulfaquents and Sulfihemists	---	---	---	---	---
TnB---------- Tinton	25	---	25	---	14
UB*, UC*, UD*. Udorthents					
UL*. Urban land					
Wa---------- Watchung	---	---	---	---	---
WdA, WdB---------- Woodstown	40	130	45	4.5	20
WkA, WkB---------- Woodstown	40	130	45	4.5	20
WlA, WlB---------- Woodstown	40	130	45	4.5	20
WU*---------- Woodstown-Urban land	---	---	---	---	---

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 6.--CAPABILITY CLASSES AND SUBCLASSES

(Miscellaneous areas and urban complexes are excluded. Absence of an entry indicates no acreage)

Class	Total acreage	Major management concerns (Subclass)		
		Erosion (e)	Wetness (w)	Soil problem (s)
		Acres	Acres	Acres
I	7,480	---	---	---
II	56,120	30,760	22,680	2,680
III	44,260	18,450	24,450	1,360
IV	7,290	2,760	3,040	1,490
V	6,780	---	6,780	---
VI	1,800	---	---	1,800
VII	6,820	480	2,250	4,090
VIII	5,280	---	5,280	---

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY

(Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available)

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Productivity class*	
At---------- Atsion	7W	Slight	Severe	Severe	Severe	Pitch pine----------	65	7	Pitch pine.
BoB, BoC-------- Boonton	6D	Slight	Slight	Slight	Slight	Yellow-poplar------- Northern red oak---- White ash----------	90 80 95	6 4 4	Eastern white pine, Austrian pine, Norway spruce.
BoD---------- Boonton	6D	Moderate	Slight	Slight	Slight	Yellow-poplar------- Northern red oak---- White ash----------	90 80 95	6 4 4	Eastern white pine, Austrian pine, Norway spruce.
BUB**: Boonton--------	6D	Slight	Slight	Slight	Slight	Yellow-poplar------- Northern red oak---- White ash----------	90 80 95	6 4 4	Eastern white pine, Austrian pine, Norway spruce.
Urban land.									
ChA, ChB-------- Chalfont	4W	Slight	Moderate	Slight	Slight	Northern red oak---- Yellow-poplar------- Sweetgum---------- Ash---------- Red maple----------	70 80 80 90 75	4 5 6 4 3	Eastern white pine, Norway spruce, white spruce, Virginia pine.
DnA, DnC, DoB--- Downer	4A	Slight	Slight	Slight	Slight	Black oak---------- White oak---------- Scarlet oak--------- Virginia pine-------	70 70 70 70	4 4 4 8	Virginia pine.
DTB**, DTD**: Downer---------	4A	Slight	Slight	Slight	Slight	Black oak---------- White oak---------- Scarlet oak--------- Virginia pine-------	70 70 70 70	4 4 4 8	Virginia pine.
Urban land.									
DUA**: Dunellen-------	4A	Slight	Slight	Slight	Slight	Black oak---------- White oak---------- Northern red oak---- Scarlet oak--------- White ash---------- Yellow-poplar-------	80 80 80 80 85 80	4 4 4 4 4 5	Eastern white pine, yellow-poplar, black walnut, Austrian pine, Norway spruce, European larch.
Urban land.									

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Productivity class*	
DvA, DvB-------- Dunellen Variant	4A	Slight	Slight	Slight	Slight	Black oak---------- White oak---------- Northern red oak---- White ash---------- Yellow-poplar-------	80 80 80 85 80	4 4 4 4 5	Eastern white pine, yellow-poplar, black walnut, Austrian pine, Norway spruce, European larch.
DWA**: Dunellen Variant-------	4A	Slight	Slight	Slight	Slight	Black oak---------- White oak---------- Northern red oak---- White ash---------- Yellow-poplar-------	80 80 80 85 80	4 4 4 4 5	Eastern white pine, yellow-poplar, black walnut, Austrian pine, Norway spruce, European larch.
Urban land.									
Ek-------------- Elkton	4W	Slight	Severe	Slight	Slight	White oak---------- Loblolly pine------- Sweetgum-----------	80 78 80	4 8 6	Loblolly pine, sweetgum.
EoA, EoB-------- Ellington Variant	4A	Slight	Slight	Slight	Slight	Northern red oak---- Eastern white pine--	80 70	4 9	Eastern white pine, yellow-poplar.
ESA**: Ellington Variant-------	4A	Slight	Slight	Slight	Slight	Northern red oak---- Eastern white pine--	80 70	4 9	Eastern white pine, yellow-poplar.
Urban land.									
EvB, EvC, EvD--- Evesboro	6S	Slight	Moderate	Slight	Slight	Pitch pine---------- Shortleaf pine------ Virginia pine------- Black oak---------- White oak---------- Chestnut oak--------	60 60 70 70 70 70	6 -- 8 4 4 4	Virginia pine.
Fa, Fb---------- Fallsington	8W	Slight	Severe	Severe	Slight	Pitch pine---------- Sweetgum---------- White oak---------- Willow oak----------	70 80 70 70	8 6 4 4	Loblolly pine, eastern white pine, sweetgum, yellow-poplar.
Fd-------------- Fallsington Variant	6W	Slight	Severe	Severe	Slight	Sweetgum---------- White oak---------- Pin oak----------	80 70 70	6 4 4	Eastern white pine, sweetgum, yellow-poplar.
FrB------------- Fort Mott	3A	Slight	Moderate	Slight	Slight	Pitch pine---------- Shortleaf pine------ Virginia pine------- Black oak---------- White oak----------	70 70 70 70 70	8 8 8 4 4	Virginia pine.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Productivity class*	
HaA, HaB-------- Haledon	4W	Slight	Moderate	Moderate	Moderate	White oak---------- Pin oak---------- White ash---------- Red maple----------	70 70 90 75	4 4 4 3	Eastern white pine.
HBB**: Haledon-------- Urban land.	4W	Slight	Moderate	Moderate	Moderate	White oak---------- Pin oak---------- White ash---------- Red maple----------	70 70 90 75	4 4 4 3	Eastern white pine.
HcA------------- Haledon Variant	4W	Slight	Severe	Severe	Severe	Swamp white oak----- Eastern white pine-- Red maple---------- Northern red oak----	70 65 60 70	4 8 3 4	Eastern white pine.
HeA------------- Hammonton	4A	Slight	Slight	Slight	Slight	Black oak---------- White oak---------- Virginia pine------- Shortleaf pine------ Pitch pine----------	80 80 80 80 80	4 4 8 8 8	Virginia pine.
HlA------------- Hammonton	4A	Slight	Slight	Slight	Slight	Black oak---------- White oak---------- Virginia pine------- Shortleaf pine------ Pitch pine----------	80 80 80 80 80	4 4 8 8 8	
HmA------------- Hammonton	4A	Slight	Slight	Slight	Slight	Black oak---------- White oak---------- Virginia pine------- Shortleaf pine------ Pitch pine----------	80 80 80 80 80	4 4 8 8 8	Virginia pine.
HoA------------- Holmdel	6A	Slight	Moderate	Slight	Slight	Yellow-poplar------- Northern red oak---- Sweetgum----------	91 80 80	6 4 6	Eastern white pine, yellow-poplar, sweetgum, shortleaf pine.
KeA, KeB, KeD, KfA, KfB, KfC, KfD---------- Keyport	6A	Slight	Moderate	Slight	Slight	Yellow-poplar------- Northern red oak---- American beech------	90 80 80	6 4 6	Yellow-poplar, northern red oak.
KGB**: Keyport-------- Urban land.	6A	Slight	Moderate	Slight	Slight	Yellow-poplar------- Northern red oak---- American beech------	90 80 80	6 4 6	Yellow-poplar, northern red oak.
KlA------------- Klej	7S	Slight	Moderate	Slight	Slight	Pitch pine---------- White oak---------- Virginia pine-------	65 70 70	7 4 8	Virginia pine, eastern white pine, loblolly pine, sweetgum.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Productivity class*	
KmA---------- Klej	7S	Slight	Moderate	Slight	Slight	Pitch pine----------	65	7	Eastern white pine, pitch pine, Virginia pine.
						White oak----------	75	4	
KUA**: Klej clayey substratum----	7S	Slight	Moderate	Slight	Slight	Pitch pine----------	65	7	Eastern white pine, pitch pine, Virginia pine.
						White oak----------	75	4	
Urban land.									
KvB, KvD-------- Klinesville	3D	Slight	Slight	Moderate	Slight	Northern red oak----	60	3	Virginia pine, eastern white pine, red pine, pitch pine.
						Virginia pine-------	60	6	
KvE---------- Klinesville	3D	Slight	Moderate	Moderate	Slight	Northern red oak----	60	3	Eastern white pine, Virginia pine.
						Virginia pine-------	60	6	
KWB**: Klinesville----	3D	Slight	Slight	Moderate	Slight	Northern red oak----	60	3	Virginia pine, eastern white pine, red pine, pitch pine.
						Virginia pine-------	60	6	
Urban land.									
LaA---------- Lakehurst	6S	Slight	Moderate	Moderate	Slight	Pitch pine----------	60	6	Virginia pine.
LeB---------- Lakewood	5S	Slight	Slight	Moderate	Slight	Pitch pine----------	50	5	Pitch pine, shortleaf pine.
						Shortleaf pine------	50	5	
						Virginia pine-------	60	6	
LnA, LnB-------- Lansdowne	4W	Slight	Moderate	Slight	Slight	Northern red oak----	70	4	Norway spruce, eastern white pine, Austrian pine.
						Yellow-poplar-------	80	5	
						Loblolly pine-------	70	6	
LUA**: Lansdowne------	4W	Slight	Moderate	Slight	Slight	Northern red oak----	70	4	Norway spruce, eastern white pine, Austrian pine.
						Yellow-poplar-------	80	5	
						Loblolly pine-------	70	6	
Urban land.									
LvA---------- Lansdowne Variant	4W	Slight	Moderate	Slight	Slight	Northern red oak----	70	4	Norway spruce, eastern white pine, Austrian pine.
						Yellow-poplar-------	80	5	
Ma---------- Manahawkin	3W	Slight	Severe	Severe	Severe	Atlantic white-cedar	50	3	Atlantic white-cedar
						Red maple----------	55	2	
						Sweetbay-----------	35	2	
						Blackgum-----------	50	3	

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Productivity class*	
MeA, MeB-------- Matapeake	4A	Slight	Slight	Slight	Slight	White oak---------- Virginia pine------- Yellow-poplar------- Loblolly pine-------	75 75 90 80	4 8 6 8	Loblolly pine, yellow-poplar, eastern white pine, sweetgum.
MgA, MgB-------- Mattapex	4A	Slight	Slight	Slight	Slight	White oak---------- Northern red oak---- Loblolly pine------- Sweetgum---------- Virginia pine-------	70 70 81 80 70	4 4 8 6 8	Loblolly pine, eastern white pine, yellow-poplar, sweetgum.
MoA, MoB, MsB--- Mount Lucas	4W	Slight	Moderate	Slight	Slight	Northern red oak---- Yellow-poplar------- Virginia pine-------	80 90 75	4 6 8	Eastern white pine, yellow-poplar, Virginia pine.
Mu---------- Mullica	7W	Slight	Severe	Severe	Slight	Pitch pine---------- Sweetgum---------- Pin oak----------	65 90 85	7 7 4	Sweetgum.
NaA, NaB-------- Nixon	4A	Slight	Slight	Slight	Slight	White oak---------- Yellow-poplar-------	80 90	4 6	Eastern white pine, yellow-poplar.
NCB**: Nixon----------	4A	Slight	Slight	Slight	Slight	White oak---------- Yellow-poplar-------	80 90	4 6	Eastern white pine, yellow-poplar.
Urban land.									
NfA, NfB-------- Nixon Variant	4A	Slight	Slight	Slight	Slight	White oak---------- Yellow-poplar-------	80 90	4 6	Eastern white pine.
NGA**: Nixon Variant--	4A	Slight	Slight	Slight	Slight	White oak---------- Yellow-poplar-------	80 90	4 6	Eastern white pine.
Urban land.									
Pa, Pb---------- Parsippany	3W	Slight	Severe	Severe	Severe	Red maple---------- Northern red oak----	65 60	3 3	Eastern white pine, white spruce.
Pc---------- Parsippany Variant	3W	Slight	Severe	Severe	Severe	Red maple---------- Pin oak----------	65 60	3 3	Eastern white pine, white spruce.
PeA---------- Pemberton	6S	Slight	Slight	Moderate	Slight	Sweetgum---------- Northern red oak---- Pin oak----------	80 80 80	6 4 4	Sweetgum, shortleaf pine.
PfA, PfB-------- Penn	4D	Slight	Slight	Slight	Slight	Northern red oak---- Yellow-poplar------- Virginia pine------- Shortleaf pine------	70 75 69 70	4 4 8 8	Yellow-poplar, Virginia pine, Norway spruce, Japanese larch.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Productivity class*	
PhD---------- Phalanx	4S	Slight	Slight	Slight	Slight	Chestnut oak-------- Black oak---------- White oak---------- Virginia pine------- Pitch pine----------	70 70 70 70 70	4 4 4 8 8	White oak
ReA, ReB-------- Reaville	4W	Slight	Moderate	Slight	Moderate	Northern red oak---- Virginia pine-------	80 80	4 8	Virginia pine, eastern white pine.
RFA**: Reaville-------	4W	Slight	Moderate	Slight	Moderate	Northern red oak---- Virginia pine-------	80 80	4 8	Virginia pine, eastern white pine.
Urban land.									
Rh---------- Reaville Variant	3W	Slight	Severe	Severe	Slight	Red maple---------- Swamp white oak----- Pin oak----------	65 65 65	3 3 3	Eastern white pine, pin oak.
Ro---------- Rowland	4W	Slight	Moderate	Slight	Slight	Northern red oak---- Yellow-poplar-------	80 95	4 7	Eastern white pine, yellow-poplar, loblolly pine, Norway spruce, European larch.
SaA, SaB, SaC, SgB, SgC, SgD, SlA, SlB------- Sassafras	5A	Slight	Slight	Slight	Slight	White oak---------- Yellow-poplar------- Loblolly pine------- Virginia pine-------	85 90 85 70	5 6 8 8	Loblolly pine, eastern white pine, yellow-poplar.
SMB**: Sassafras------	5A	Slight	Slight	Slight	Slight	White oak---------- Yellow-poplar------- Loblolly pine------- Virginia pine-------	85 90 85 70	5 6 8 8	Loblolly pine, eastern white pine, yellow-poplar.
Urban land.									
SrA---------- Shrewsbury	4W	Slight	Severe	Severe	Moderate	Pin oak---------- Sweetgum----------	80 90	4 7	Eastern white pine, sweetgum, loblolly pine.
TnB---------- Tinton	4S	Slight	Moderate	Moderate	Slight	Northern red oak---- Virginia pine------- Shortleaf pine------ White oak---------- Black oak----------	70 70 70 70 70	4 8 8 4 4	Eastern white pine.
Wa---------- Watchung	4X	Slight	Severe	Severe	Slight	Pin oak---------- Northern red oak----	85 80	4 4	Eastern white pine, European larch, Norway spruce.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Productivity class*	
WdA, WdB-------- Woodstown	5A	Slight	Slight	Slight	Slight	White oak---------- Yellow-poplar------- Loblolly pine------- Sweetgum----------- Northern red oak----	85 90 85 90 85	5 6 8 7 5	Loblolly pine, yellow-poplar, eastern white pine, sweetgum.
WkA, WkB-------- Woodstown	5A	Slight	Slight	Slight	Slight	White oak---------- Yellow-poplar------- Sweetgum----------- Northern red oak---- Black oak----------	85 90 90 85 85	5 6 7 5 5	Yellow-poplar, eastern white pine, sweetgum.
W1A, W1B-------- Woodstown	5A	Slight	Slight	Slight	Slight	White oak---------- Yellow-poplar------- Loblolly pine------- Sweetgum----------- Northern red oak----	85 90 85 90 85	5 6 8 7 5	Loblolly pine, yellow-poplar, eastern white pine, sweetgum.
WU**: Woodstown------	5A	Slight	Slight	Slight	Slight	White oak---------- Yellow-poplar------- Loblolly pine------- Sweetgum----------- Northern red oak----	85 90 85 90 85	5 6 8 7 5	Loblolly pine, yellow-poplar, eastern white pine, sweetgum.
Urban land.									

* Productivity class is the yield in cubic meters per hectare per year calculated at the age of culmination of mean annual increment for fully stocked natural stands.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--RECREATIONAL DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
At Atsion	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness, too sandy.
BoB, BoC Boonton	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Severe: erodes easily.	Moderate: wetness.
BoD Boonton	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Moderate: wetness, slope.
BUB*: Boonton	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Severe: erodes easily.	Moderate: wetness.
Urban land.					
ChA, ChB Chalfont	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, erodes easily.	Severe: wetness.
DnA Downer	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: droughty.
DnC Downer	Slight	Slight	Severe: slope.	Slight	Moderate: droughty.
DoB Downer	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: droughty.
DTB*: Downer	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: droughty.
Urban land.					
DTD*: Downer	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
Urban land.					
DUA*: Dunellen	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
Urban land.					
DvA Dunellen Variant	Slight	Slight	Slight	Slight	Moderate: droughty.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
DvB---------- Dunellen Variant	Slight----------	Slight----------	Moderate: slope.	Slight----------	Moderate: droughty.
DWA*: Dunellen Variant-----	Slight----------	Slight----------	Moderate: slope.	Slight----------	Moderate: droughty.
Urban land.					
Ek---------- Elkton	Severe: flooding, wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, erodes easily.	Severe: wetness.
EoA, EoB---------- Ellington Variant	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, thin layer.
ESA*: Ellington Variant----	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, thin layer.
Urban land.					
EvB---------- Evesboro	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
EvC, EvD---------- Evesboro	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Severe: droughty.
Fa, Fb---------- Fallsington	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Fd---------- Fallsington Variant	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
FrB---------- Fort Mott	Slight----------	Slight----------	Moderate: slope, small stones.	Slight----------	Moderate: droughty.
HaA, HaB---------- Haledon	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
HBB*: Haledon----------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Urban land.					
HcA---------- Haledon Variant	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
HeA, HlA, HmA--------- Hammonton	Moderate: wetness.	Moderate: wetness.	Moderate: small stones, wetness.	Moderate: wetness.	Moderate: wetness, droughty.
HoA---------- Holmdel	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
HU*. Humaquepts					
KeA, KeB---------- Keyport	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Severe: erodes easily.	Moderate: wetness.
KeD---------- Keyport	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Moderate: wetness, slope.
KfA, KfB---------- Keyport	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Severe: erodes easily.	Moderate: wetness.
KfC---------- Keyport	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Moderate: wetness.
KfD---------- Keyport	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Moderate: wetness, slope.
KGB*: Keyport----------	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Severe: erodes easily.	Moderate: wetness.
Urban land.					
KlA---------- Klej	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness, droughty.
KmA---------- Klej	Moderate: too sandy, wetness.	Moderate: too sandy.	Severe: too sandy, wetness.	Moderate: too sandy.	Severe: too sandy.
KUA*: Klej----------	Moderate: too sandy, wetness.	Moderate: too sandy.	Severe: too sandy, wetness.	Moderate: too sandy.	Severe: too sandy.
Urban land.					
KvB---------- Klinesville	Severe: small stones, depth to rock.	Severe: small stones, depth to rock.	Severe: small stones, depth to rock.	Severe: small stones.	Severe: small stones, thin layer.
KvD---------- Klinesville	Severe: small stones, depth to rock.	Severe: small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: small stones.	Severe: small stones, thin layer.
KvE---------- Klinesville	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: small stones.	Severe: small stones, slope, thin layer.
KWB*: Klinesville----------	Severe: small stones, depth to rock.	Severe: small stones, depth to rock.	Severe: small stones, depth to rock.	Severe: small stones.	Severe: small stones, thin layer.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
KWB*: Urban land.					
LaA---------- Lakehurst	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
LeB---------- Lakewood	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
LnA, LnB---------- Lansdowne	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Severe: erodes easily.	Moderate: wetness.
LUA*: Lansdowne----------	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Severe: erodes easily.	Moderate: wetness.
Urban land.					
LvA---------- Lansdowne Variant	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Severe: erodes easily.	Moderate: wetness, thin layer.
Ma---------- Manahawkin	Severe: flooding, excess humus, ponding.	Severe: ponding, excess humus.	Severe: flooding, excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, flooding, excess humus.
MeA---------- Matapeake	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: percs slowly.	Slight----------	Slight.
MeB---------- Matapeake	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight----------	Slight.
MgA---------- Mattapex	Moderate: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness.
MgB---------- Mattapex	Moderate: wetness, percs slowly.	Moderate: wetness.	Moderate: slope, wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness.
MoA, MoB---------- Mount Lucas	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, erodes easily.	Severe: wetness.
MsB---------- Mount Lucas	Severe: wetness.	Severe: wetness.	Severe: large stones, small stones.	Severe: wetness.	Severe: wetness.
Mu---------- Mullica	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
NaA---------- Nixon	Slight----------	Slight----------	Moderate: small stones.	Slight----------	Slight.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
NaB---------- Nixon	Slight----------	Slight----------	Moderate: slope, small stones.	Slight----------	Slight.
NCB*: Nixon----------	Slight----------	Slight----------	Moderate: slope, small stones.	Slight----------	Slight.
Urban land.					
NfA, NfB---------- Nixon Variant	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
NGA*: Nixon Variant--------	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Urban land.					
Pa---------- Parsippany	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, erodes easily.	Severe: wetness.
Pb---------- Parsippany	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, erodes easily.	Severe: wetness, flooding.
Pc---------- Parsippany Variant	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, erodes easily.	Severe: wetness.
PeA---------- Pemberton	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, droughty.
PfA---------- Penn	Slight----------	Slight----------	Slight----------	Slight----------	Moderate: thin layer.
PfB---------- Penn	Slight----------	Slight----------	Moderate: slope.	Slight----------	Moderate: thin layer.
PhD---------- Phalanx	Severe: cemented pan.	Severe: cemented pan.	Severe: slope, cemented pan.	Slight----------	Severe: thin layer.
PL*, PM*. Pits					
PN*, PO*, PW*. Psamments					
ReA---------- Reaville	Severe: wetness.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness, thin layer.
ReB---------- Reaville	Severe: wetness.	Moderate: wetness, percs slowly.	Moderate: wetness, slope, depth to rock.	Severe: erodes easily.	Moderate: wetness, thin layer.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
RFA*: Reaville	Severe: wetness.	Moderate: wetness, percs slowly.	Moderate: wetness, slope, depth to rock.	Severe: erodes easily.	Moderate: wetness, thin layer.
Urban land.					
Rh Reaville Variant	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, erodes easily.	Severe: wetness.
Ro Rowland	Severe: flooding, wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Severe: erodes easily.	Moderate: wetness, flooding.
SaA Sassafras	Slight	Slight	Moderate: small stones.	Slight	Slight.
SaB Sassafras	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
SaC Sassafras	Slight	Slight	Severe: slope.	Slight	Slight.
SgB Sassafras	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight	Moderate: small stones.
SgC Sassafras	Moderate: small stones.	Moderate: small stones.	Severe: slope, small stones.	Slight	Moderate: small stones.
SgD Sassafras	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight	Moderate: small stones, slope.
SlA Sassafras	Slight	Slight	Moderate: small stones.	Slight	Slight.
SlB Sassafras	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
SMB*: Sassafras	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
Urban land.					
SrA Shrewsbury	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
SU*: Sulfaquents.					
Sulfihemists.					
TnB Tinton	Severe: slope.	Slight	Moderate: slope.	Slight	Moderate: droughty.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
UB*, UC*, UD*. Udorthents					
UL*. Urban land					
Wa---------- Watchung	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: large stones, wetness.	Severe: wetness, erodes easily.	Severe: wetness.
WdA---------- Woodstown	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
WdB---------- Woodstown	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Moderate: wetness.	Moderate: wetness.
WkA---------- Woodstown	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Slight----------	Slight.
WkB---------- Woodstown	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Slight----------	Slight.
WlA---------- Woodstown	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
WlB---------- Woodstown	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Moderate: wetness.	Moderate: wetness.
WU*: Woodstown----------	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Moderate: wetness.	Moderate: wetness.
Urban land.					

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--WILDLIFE HABITAT

(See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
At---------- Atsion	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
BoB, BoC---------- Boonton	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
BoD---------- Boonton	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
BUB*: Boonton----------	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Urban land.										
ChA---------- Chalfont	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
ChB---------- Chalfont	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
DnA, DnC---------- Downer	Poor	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
DoB---------- Downer	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
DTB*: Downer----------	Poor	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
Urban land.										
DTD*: Downer.										
Urban land.										
DUA*: Dunellen----------	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Urban land.										
DvA---------- Dunellen Variant	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
DvB---------- Dunellen Variant	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
DWA*: Dunellen Variant--	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Urban land.										

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
Ek---------- Elkton	Poor	Fair	Fair	Fair	Fair	Good	Poor	Fair	Fair	Fair.
EoA, EoB---------- Ellington Variant	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
ESA*: Ellington Variant-	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Urban land.										
EvB, EvC---------- Evesboro	Poor	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
EvD---------- Evesboro	Very poor.	Very poor.	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.
Fa, Fb. Fallsington										
Fd. Fallsington Variant										
FrB---------- Fort Mott	Poor	Fair	Fair	Poor	Poor	Poor	Very poor.	Fair	Poor	Very poor.
HaA---------- Haledon	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
HaB---------- Haledon	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
HBB*: Haledon----------	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Urban land.										
HcA---------- Haledon Variant	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
HeA, HlA---------- Hammonton	Poor	Fair	Good	Fair	Fair	Poor	Poor	Fair	Fair	Poor.
HmA---------- Hammonton	Good	Good	Good	Fair	Fair	Poor	Poor	Good	Fair	Poor.
HoA---------- Holmdel	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
HU*. Humaquepts										
KeA, KeB---------- Keyport	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
KeD---------- Keyport	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
KfA, KfB, KfC------ Keyport	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
KfD---------- Keyport	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
KGB*: Keyport----------	Fair	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Urban land.										
KlA---------- Klej	Fair	Fair	Good	Fair	Fair	Poor	Poor	Fair	Fair	Poor.
KmA---------- Klej	Poor	Fair	Good	Fair	Fair	Fair	Fair	Fair	Fair	Fair.
KUA*: Klej clayey substratum-------	Poor	Fair	Good	Fair	Fair	Fair	Fair	Fair	Fair	Fair.
Urban land.										
KvB, KvD, KvE------ Klinesville	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
KWB*: Klinesville-------	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Urban land.										
LaA---------- Lakehurst	Poor	Poor	Fair	Poor	Poor	Fair	Fair	Fair	Poor	Fair.
LeB---------- Lakewood	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
LnA---------- Lansdowne	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
LnB---------- Lansdowne	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
LUA*: Lansdowne---------	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Urban land.										
LvA---------- Lansdowne Variant	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Ma---------- Manahawkin	Very poor.	Poor	Poor	Poor	Poor	Good	Poor	Poor	Poor	Good.
MeA---------- Matapeake	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
MeB---------- Matapeake	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
MgA---------- Mattapex	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
MgB---------- Mattapex	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
MoA---------- Mount Lucas	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
MoB---------- Mount Lucas	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
MsB---------- Mount Lucas	Very poor.	Poor	Poor	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Mu---------- Mullica	Very poor.	Poor	Poor	Poor	Poor	Good	Fair	Poor	Poor	Good.
NaA, NaB---------- Nixon	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
NCB*: Nixon----------	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Urban land.										
NfA, NfB---------- Nixon Variant	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
NGA*: Nixon Variant-----	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Urban land.										
Pa, Pb---------- Parsippany	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Pc---------- Parsippany Variant	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
PeA---------- Pemberton	Poor	Poor	Good	Good	Good	Poor	Poor	Fair	Good	Poor.
PfA, PfB---------- Penn	Good	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
PhD---------- Phalanx	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
PL*, PM*. Pits										
PN*, PO*, PW*. Psamments										
ReA---------- Reaville	Poor	Fair	Fair	Poor	Poor	Poor	Poor	Fair	Poor	Poor.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
ReB---------- Reaville	Poor	Fair	Fair	Poor	Poor	Poor	Very poor.	Fair	Poor	Very poor.
RFA*: Reaville----------	Poor	Fair	Fair	Poor	Poor	Poor	Poor	Fair	Poor	Poor.
Urban land.										
Rh---------- Reaville Variant	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Ro---------- Rowland	Fair	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
SaA, SaB---------- Sassafras	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
SaC---------- Sassafras	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
SgB---------- Sassafras	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
SgC, SgD---------- Sassafras	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
SlA, SlB---------- Sassafras	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
SMB*: Sassafras---------	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Urban land.										
SrA---------- Shrewsbury	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
SU*: Sulfaquents.										
Sulfihemists.										
TnB---------- Tinton	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Fair	Very poor.
UB*, UC*, UD*. Udorthents										
UL*. Urban land										
Wa---------- Watchung	Very poor.	Poor	Fair	Fair	Fair	Good	Fair	Poor	Fair	Fair.
WdA---------- Woodstown	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
WdB---------- Woodstown	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
WkA---------- Woodstown	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
WkB---------- Woodstown	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
WlA---------- Woodstown	Good	Good	Good	Good	Poor	Poor	Poor	Good	Good	Poor.
WlB---------- Woodstown	Good	Good	Good	Good	Poor	Poor	Very poor.	Good	Good	Very poor.
WU*: Woodstown---------	Fair	Good	Good	Good	Poor	Poor	Very poor.	Good	Good	Very poor.
Urban land.										

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--BUILDING SITE DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
At---------- Atsion	Severe: wetness, cutbanks cave.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, too sandy.
BoB, BoC---------- Boonton	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness, slope.	Moderate: wetness, frost action.	Moderate: wetness.
BoD---------- Boonton	Severe: wetness.	Moderate: wetness, slope.	Severe: wetness.	Severe: slope.	Moderate: wetness, slope, frost action.	Moderate: wetness, slope.
BUB*: Boonton----------	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness, slope.	Moderate: wetness, frost action.	Moderate: wetness.
Urban land.						
ChA, ChB---------- Chalfont	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
DnA---------- Downer	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty.
DnC---------- Downer	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Slight---------	Moderate: droughty.
DoB---------- Downer	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty.
DTB*: Downer----------	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Slight---------	Moderate: droughty.
Urban land.						
DTD*: Downer----------	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
Urban land.						
DUA*: Dunellen---------	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: frost action.	Slight.
Urban land.						
DvA, DvB---------- Dunellen Variant	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Moderate: frost action.	Moderate: droughty.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
DWA*: Dunellen Variant- Urban land.	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Moderate: droughty.
Ek--- Elkton	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, frost action.	Severe: wetness.
EoA, EoB--- Ellington Variant	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness, thin layer.
ESA*: Ellington Variant	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness, thin layer.
Urban land.						
EvB--- Evesboro	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Severe: droughty.
EvC--- Evesboro	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Severe: droughty.
EvD--- Evesboro	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: droughty.
Fa, Fb--- Fallsington	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
Fd--- Fallsington Variant	Severe: wetness, cutbanks cave.	Severe: wetness, flooding.	Severe: wetness, flooding.	Severe: wetness, flooding.	Severe: low strength, wetness.	Severe: wetness.
FrB--- Fort Mott	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Moderate: droughty.
HaA, HaB--- Haledon	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
HBB*: Haledon---	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
Urban land.						
HcA--- Haledon Variant	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action, wetness.	Severe: wetness.
HeA, HlA, HmA--- Hammonton	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Severe: frost action.	Moderate: wetness, droughty.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
HoA---------- Holmdel	Severe: wetness, cutbanks cave.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
HU*. Humaquepts						
KeA, KeB---------- Keyport	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.	Moderate: wetness.
KeD---------- Keyport	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: wetness.	Severe: slope.	Severe: low strength, frost action.	Moderate: wetness, slope.
KfA, KfB---------- Keyport	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.	Moderate: wetness.
KfC---------- Keyport	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: low strength, frost action.	Moderate: wetness.
KfD---------- Keyport	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: wetness.	Severe: slope.	Severe: low strength, frost action.	Moderate: wetness, slope.
KGB*: Keyport----------	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: low strength, frost action.	Moderate: wetness.
Urban land.						
KlA---------- Klej	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, frost action.	Moderate: wetness, droughty.
KmA---------- Klej	Severe: wetness, cutbanks cave.	Moderate: wetness, frost action.	Severe: wetness.	Moderate: wetness, frost action.	Moderate: wetness, frost action.	Severe: too sandy.
KUA*: Klej clayey substrat--------	Severe: wetness, cutbanks cave.	Moderate: wetness, frost action.	Severe: wetness.	Moderate: wetness, frost action.	Moderate: wetness, frost action.	Severe: too sandy.
Urban land.						
KvB---------- Klinesville	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: depth to rock.	Moderate: depth to rock, frost action.	Severe: small stones, thin layer.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
KvD---------- Klinesville	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, slope, frost action.	Severe: small stones, thin layer.
KvE---------- Klinesville	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope, thin layer.
KWB*: Klinesville------	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: depth to rock.	Moderate: depth to rock, frost action.	Severe: small stones, thin layer.
Urban land.						
LaA---------- Lakehurst	Severe: wetness, cutbanks cave.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Severe: droughty.
LeB---------- Lakewood	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Slight---------	Severe: droughty.
LnA, LnB---------- Lansdowne	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
LUA*: Lansdowne--------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Urban land.						
LvA---------- Lansdowne Variant	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action, low strength.	Moderate: wetness, thin layer.
Ma---------- Manahawkin	Severe: cutbanks cave, excess humus, ponding.	Severe: flooding, ponding, low strength.	Severe: flooding, ponding.	Severe: flooding, ponding, low strength.	Severe: flooding, ponding, frost action.	Severe: ponding, flooding, excess humus.
MeA, MeB---------- Matapeake	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Moderate: low strength, frost action.	Slight.
MgA, MgB---------- Mattapex	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Severe: low strength, frost action.	Moderate: wetness.
MoA, MoB, MsB----- Mount Lucas	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
Mu---------- Mullica	Severe: wetness, cutbanks cave.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, frost action.	Severe: wetness.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
NaA, NaB---------- Nixon	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: frost action.	Slight.
NCB*: Nixon----------	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: frost action.	Slight.
Urban land.						
NfA, NfB---------- Nixon Variant	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
NGA*: Nixon Variant----	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
Urban land.						
Pa---------- Parsippany	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, wetness.	Severe: wetness.
Pb---------- Parsippany	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness, flooding.
Pc---------- Parsippany Variant	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
PeA---------- Pemberton	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness, frost action.	Moderate: wetness, droughty.
PfA, PfB---------- Penn	Moderate: depth to rock.	Slight---------	Moderate: depth to rock.	Slight---------	Moderate: frost action.	Moderate: thin layer.
PhD---------- Phalanx	Severe: cemented pan, cutbanks cave.	Moderate: slope, cemented pan.	Severe: cemented pan.	Severe: slope.	Moderate: cemented pan, slope.	Severe: thin layer.
PL*, PM*. Pits						
PN*, PO*, PW*. Psamments						
ReA, ReB---------- Reaville	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness, thin layer.
RFA*: Reaville---------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness, thin layer.
Urban land.						

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Rh---------- Reaville Variant	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action, low strength.	Severe: wetness.
Ro---------- Rowland	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action.	Moderate: wetness, flooding.
SaA, SaB---------- Sassafras	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Moderate: frost action.	Slight.
SaC---------- Sassafras	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Moderate: frost action.	Slight.
SgB---------- Sassafras	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Moderate: frost action.	Moderate: small stones.
SgC---------- Sassafras	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Moderate: frost action.	Moderate: small stones.
SgD---------- Sassafras	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: small stones, slope.
SlA, SlB---------- Sassafras	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Moderate: frost action.	Slight.
SMB*: Sassafras--------	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Moderate: frost action.	Slight.
Urban land.						
SrA---------- Shrewsbury	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
SU*: Sulfaquents.						
Sulfihemists.						
TnB---------- Tinton	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Moderate: frost action.	Moderate: droughty.
UB*, UC*, UD*. Udorthents						
UL*. Urban land						
Wa---------- Watchung	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, wetness, frost action.	Severe: wetness.
WdA, WdB---------- Woodstown	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Severe: frost action.	Moderate: wetness.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
WkA, WkB---------- Woodstown	Severe: wetness.	Severe: frost action.	Severe: wetness.	Severe: frost action.	Severe: frost action.	Slight.
W1A, W1B---------- Woodstown	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Severe: frost action.	Moderate: wetness.
WU*: Woodstown--------	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Severe: frost action.	Moderate: wetness.
Urban land.						

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--SANITARY FACILITIES

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "good," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
At Atsion	Severe: wetness, poor filter.	Severe: wetness, seepage.	Severe: seepage, wetness, too sandy.	Severe: wetness, seepage.	Poor: seepage, too sandy, wetness.
BoB, BoC Boonton	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Poor: small stones.
BoD Boonton	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: wetness.	Moderate: wetness, slope.	Poor: small stones.
BUB*: Boonton	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Poor: small stones.
Urban land.					
ChA Chalfont	Severe: wetness, percs slowly.	Moderate: seepage, depth to rock.	Severe: depth to rock, wetness.	Severe: wetness.	Poor: wetness, thin layer.
ChB Chalfont	Severe: wetness, percs slowly.	Moderate: seepage, slope, depth to rock.	Severe: depth to rock, wetness.	Severe: wetness.	Poor: wetness, thin layer.
DnA Downer	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
DnC Downer	Severe: poor filter.	Severe: slope, seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
DoB Downer	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
DTB*: Downer	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Urban land.					
DTD*: Downer	Severe: poor filter.	Severe: slope, seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Urban land.					

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
DUA*: Dunellen	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: too sandy.
Urban land.					
DvA, DvB---- Dunellen Variant	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy.
DWA*: Dunellen Variant---	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy.
Urban land.					
Ek---- Elkton	Severe: wetness, percs slowly.	Severe: seepage, flooding, wetness.	Severe: seepage, wetness, too clayey.	Severe: seepage, wetness.	Poor: too clayey, hard to pack, wetness.
EoA, EoB---- Ellington Variant	Severe: depth to rock, wetness.	Severe: wetness, seepage, depth to rock.	Severe: depth to rock, seepage, wetness.	Severe: depth to rock, seepage, wetness.	Poor: area reclaim, wetness.
ESA*: Ellington Variant--	Severe: depth to rock, wetness.	Severe: wetness, seepage, depth to rock.	Severe: depth to rock, seepage, wetness.	Severe: depth to rock, seepage, wetness.	Poor: area reclaim, wetness.
Urban land.					
EvB---- Evesboro	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
EvC, EvD---- Evesboro	Severe: poor filter.	Severe: slope, seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Fa, Fb---- Fallsington	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
Fd---- Fallsington Variant	Severe: flooding, wetness, flooding.	Severe: seepage, wetness, flooding.	Severe: flooding, seepage, wetness.	Severe: seepage, wetness.	Poor: wetness.
FrB---- Fort Mott	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: seepage.
HaA, HaB---- Haledon	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
HBB*: Haledon	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Urban land.					
HcA---- Haledon Variant	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
HeA---- Hammonton	Severe: wetness, poor filter.	Severe: wetness, seepage.	Severe: seepage, wetness, too sandy.	Severe: wetness, seepage.	Poor: seepage, too sandy, small stones.
HlA---- Hammonton	Severe: wetness, percs slowly, poor filter.	Severe: seepage, wetness.	Severe: wetness.	Severe: seepage.	Poor: thin layer.
HmA---- Hammonton	Severe: wetness, poor filter.	Severe: wetness, seepage.	Severe: seepage, wetness, too sandy.	Severe: wetness, seepage.	Poor: seepage, too sandy, small stones.
HoA---- Holmdel	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness, thin layer.
HU*. Humaquepts					
KeA, KeB---- Keyport	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
KeD---- Keyport	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: wetness, too clayey.	Moderate: wetness, slope.	Poor: too clayey, hard to pack.
KfA, KfB---- Keyport	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
KfC---- Keyport	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
KfD---- Keyport	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: wetness, too clayey.	Moderate: wetness, slope.	Poor: too clayey, hard to pack.
KGB*: Keyport----	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
Urban land.					

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
KlA---------- Klej	Severe: wetness, percs slowly, poor filter.	Severe: seepage, wetness.	Severe: wetness.	Severe: seepage, wetness.	Fair: too sandy, wetness.
KmA---------- Klej	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too sandy.
KUA*: Klej clayey substratum--------	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too sandy.
Urban land.					
KvB---------- Klinesville	Severe: depth to rock.	Severe: seepage, depth to rock.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: area reclaim, seepage, small stones.
KvD---------- Klinesville	Severe: depth to rock.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: area reclaim, seepage, small stones.
KvE---------- Klinesville	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, seepage, small stones.
KWB*: Klinesville--------	Severe: depth to rock.	Severe: seepage, depth to rock.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: area reclaim, seepage, small stones.
Urban land.					
LaA---------- Lakehurst	Moderate: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
LeB---------- Lakewood	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
LnA, LnB---------- Lansdowne	Severe: wetness, percs slowly.	Severe: wetness.	Severe: depth to rock, wetness, too clayey.	Severe: wetness.	Poor: too clayey, wetness.
LUA*: Lansdowne----------	Severe: wetness, percs slowly.	Severe: wetness.	Severe: depth to rock, wetness, too clayey.	Severe: wetness.	Poor: too clayey, wetness.
Urban land.					

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
LvA---------- Lansdowne Variant	Severe: depth to rock, wetness.	Severe: depth to rock, wetness.	Severe: wetness, depth to rock, too clayey.	Severe: depth to rock, wetness.	Poor: area reclaim, too clayey, hard to pack.
Ma---------- Manahawkin	Severe: flooding, ponding.	Severe: seepage, flooding, excess humus.	Severe: flooding, seepage, ponding.	Severe: flooding, seepage, ponding.	Poor: ponding, excess humus.
MeA, MeB---------- Matapeake	Severe: percs slowly.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
MgA, MgB---------- Mattapex	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Fair: wetness.
MoA, MoB, MsB------- Mount Lucas	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Severe: depth to rock, seepage, wetness.	Severe: seepage, wetness.	Poor: small stones, wetness.
Mu---------- Mullica	Severe: wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: seepage, wetness, too sandy.	Severe: wetness, seepage.	Poor: seepage, too sandy, wetness.
NaA---------- Nixon	Slight----------	Moderate: seepage.	Severe: seepage, depth to rock.	Slight----------	Fair: small stones.
NaB---------- Nixon	Slight----------	Moderate: slope, seepage.	Severe: seepage, depth to rock.	Slight----------	Fair: small stones.
NCB*: Nixon----------	Slight----------	Moderate: slope, seepage.	Severe: seepage, depth to rock.	Slight----------	Fair: small stones.
Urban land.					
NfA, NfB---------- Nixon Variant	Severe: wetness.	Severe: wetness, seepage.	Severe: wetness, seepage.	Severe: wetness, seepage.	Poor: wetness, thin layer.
NGA*: Nixon Variant------	Severe: wetness.	Severe: wetness, seepage.	Severe: wetness, seepage.	Severe: wetness, seepage.	Poor: wetness, thin layer.
Urban land.					
Pa---------- Parsippany	Severe: wetness, percs slowly.	Severe: seepage.	Severe: seepage, wetness.	Severe: wetness.	Poor: wetness.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Pb---------- Parsippany	Severe: flooding, wetness, percs slowly.	Severe: seepage, flooding.	Severe: flooding, seepage, wetness.	Severe: flooding, wetness.	Poor: wetness.
Pc---------- Parsippany Variant	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: too sandy, wetness.
PeA---------- Pemberton	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness, too clayey.	Severe: seepage, wetness.	Poor: seepage, too clayey, too sandy.
PfA, PfB---------- Penn	Severe: depth to rock.	Severe: seepage, depth to rock.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: area reclaim, small stones.
PhD---------- Phalanx	Severe: cemented pan.	Severe: seepage, cemented pan, slope.	Severe: seepage.	Severe: cemented pan, seepage.	Poor: area reclaim, small stones.
PL*, PM*. Pits					
PN*, PO*, PW*. Psamments					
ReA, ReB---------- Reaville	Severe: wetness, depth to rock, percs slowly.	Severe: wetness, depth to rock, percs slowly.	Severe: wetness, depth to rock.	Severe: wetness, depth to rock.	Poor: area reclaim, wetness, small stones.
RFA*: Reaville----------	Severe: wetness, depth to rock, percs slowly.	Severe: wetness, depth to rock, percs slowly.	Severe: wetness, depth to rock.	Severe: wetness, depth to rock.	Poor: area reclaim, wetness, small stones.
Urban land.					
Rh---------- Reaville Variant	Severe: wetness, percs slowly, depth to rock.	Severe: depth to rock, wetness.	Severe: wetness, depth to rock.	Severe: wetness, depth to rock.	Poor: wetness, area reclaim, hard to pack.
Ro---------- Rowland	Severe: flooding, wetness, percs slowly.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, wetness.	Poor: wetness.
SaA, SaB---------- Sassafras	Slight----------	Severe: seepage.	Severe: seepage.	Slight----------	Fair: thin layer.
SaC---------- Sassafras	Slight----------	Severe: seepage, slope.	Severe: seepage.	Slight----------	Fair: thin layer.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
SgB---------- Sassafras	Slight----------	Severe: seepage.	Severe: seepage.	Slight----------	Fair: thin layer.
SgC---------- Sassafras	Slight----------	Severe: seepage, slope.	Severe: seepage.	Slight----------	Fair: thin layer.
SgD---------- Sassafras	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Moderate: slope.	Fair: slope, thin layer.
SlA, SlB---------- Sassafras	Slight----------	Severe: seepage.	Severe: seepage.	Slight----------	Fair: thin layer.
SMB*: Sassafras----------	Slight----------	Severe: seepage.	Severe: seepage.	Slight----------	Fair: thin layer.
Urban land.					
SrA---------- Shrewsbury	Severe: wetness, percs slowly, poor filter.	Severe: wetness, seepage.	Severe: wetness, seepage.	Severe: wetness, seepage.	Poor: wetness.
SU*: Sulfaquents.					
Sulfihemists.					
TnB---------- Tinton	Slight----------	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
UB*, UC*, UD*. Udorthents					
UL*. Urban land					
Wa---------- Watchung	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
WdA, WdB---------- Woodstown	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
WkA, WkB---------- Woodstown	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Good.
WlA, WlB---------- Woodstown	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
WU*:					
Woodstown	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
Urban land.					

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--CONSTRUCTION MATERIALS

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
At Atsion	Poor: wetness.	Probable	Improbable: too sandy.	Poor: wetness, too sandy.
BoB, BoC, BoD Boonton	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
BUB*: Boonton	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
Urban land.				
ChA, ChB Chalfont	Poor: wetness, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, wetness.
DnA, DnC, DoB Downer	Good	Probable	Improbable: too sandy.	Poor: small stones.
DTB*, DTD*: Downer	Good	Probable	Improbable: too sandy.	Poor: small stones.
Urban land.				
DUA*: Dunellen	Good	Probable	Probable	Poor: small stones, area reclaim.
Urban land.				
DvA, DvB Dunellen Variant	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
DWA*: Dunellen Variant	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Urban land.				
Ek Elkton	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
EoA, EoB Ellington Variant	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones, thin layer.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
ESA*: Ellington Variant	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones, thin layer.
Urban land.				
EvB, EvC, EvD---- Evesboro	Good	Probable	Probable	Poor: too sandy.
Fa, Fb---- Fallsington	Poor: wetness.	Probable	Improbable: too sandy.	Poor: wetness.
Fd---- Fallsington Variant	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
FrB---- Fort Mott	Good	Probable	Improbable: too sandy.	Fair: too sandy, small stones.
HaA, HaB---- Haledon	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, area reclaim, wetness.
HBB*: Haledon----	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, area reclaim, wetness.
Urban land.				
HcA---- Haledon Variant	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, wetness.
HeA---- Hammonton	Fair: wetness.	Probable	Improbable: excess fines.	Poor: too sandy, droughty.
HlA---- Hammonton	Fair: thin layer, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
HmA---- Hammonton	Fair: wetness.	Probable	Improbable: excess fines.	Poor: small stones, area reclaim.
HoA---- Holmdel	Poor: wetness.	Probable	Improbable: too sandy.	Poor: wetness.
HU*. Humaquepts				
KeA, KeB, KeD, KfA, KfB, KfC, KfD---- Keyport	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, too clayey.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
KGB*: Keyport	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, too clayey.
Urban land.				
KlA Klej	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, small stones.
KmA Klej	Fair: frost action.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy.
KUA*: Klej clayey substratum	Fair: frost action.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy.
Urban land.				
KvB, KvD Klinesville	Poor: area reclaim.	Improbable: thin layer.	Improbable: thin layer.	Poor: area reclaim, small stones.
KvE Klinesville	Poor: area reclaim.	Improbable: thin layer.	Improbable: thin layer.	Poor: area reclaim, small stones, slope.
KWB*: Klinesville	Poor: area reclaim.	Improbable: thin layer.	Improbable: thin layer.	Poor: area reclaim, small stones.
Urban land.				
LaA Lakehurst	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy.
LeB Lakewood	Good	Probable	Improbable: too sandy.	Poor: too sandy.
LnA, LnB Lansdowne	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
LUA*: Lansdowne	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Urban land.				
LvA Lansdowne Variant	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Ma Manahawkin	Poor: wetness.	Probable	Probable	Poor: excess humus, area reclaim, wetness.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
MeA, MeB---------- Matapeake	Good----------	Probable----------	Improbable: too sandy.	Fair: thin layer.
MgA, MgB---------- Mattapex	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
MoA, MoB, MsB--------- Mount Lucas	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, wetness.
Mu---------- Mullica	Poor: wetness.	Probable----------	Probable----------	Poor: small stones, wetness.
NaA, NaB---------- Nixon	Good----------	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
NCB*: Nixon----------	Good----------	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Urban land.				
NfA, NfB---------- Nixon Variant	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
NGA*: Nixon Variant--------	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
Urban land.				
Pa, Pb---------- Parsippany	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Pc---------- Parsippany Variant	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
PeA---------- Pemberton	Fair: wetness.	Probable----------	Improbable: too sandy.	Fair: too sandy.
PfA, PfB---------- Penn	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
PhD---------- Phalanx	Good----------	Probable----------	Probable----------	Poor: area reclaim, small stones.
PL*, PM*. Pits				
PN*, PO*, PW*. Psamments				
ReA, ReB---------- Reaville	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
RFA*: Reaville	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
Urban land.				
Rh---- Reaville Variant	Poor: area reclaim, wetness, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Ro---- Rowland	Fair: wetness, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
SaA, SaB, SaC---- Sassafras	Good----	Probable----	Probable----	Fair: small stones.
SgB, SgC, SgD---- Sassafras	Good----	Probable----	Probable----	Poor: small stones.
SlA, SlB---- Sassafras	Good----	Probable----	Probable----	Fair: small stones.
SMB*: Sassafras	Good----	Probable----	Probable----	Fair: small stones.
Urban land.				
SrA---- Shrewsbury	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, wetness.
SU*: Sulfaquents.				
Sulfihemists.				
TnB---- Tinton	Good----	Probable----	Improbable: too sandy.	Fair: too sandy, small stones.
UB*, UC*, UD*. Udorthents				
UL*. Urban land				
Wa---- Watchung	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, wetness.
WdA, WdB---- Woodstown	Fair: wetness.	Probable----	Improbable: too sandy.	Fair: small stones, area reclaim, thin layer.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
WkA, WkB---------- Woodstown	Fair: wetness, frost action.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
W1A, W1B---------- Woodstown	Fair: wetness.	Probable----------	Improbable: too sandy.	Fair: small stones, area reclaim, thin layer.
WU*: Woodstown----------	Fair: wetness.	Probable----------	Improbable: too sandy.	Fair: small stones, area reclaim, thin layer.
Urban land.				

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--WATER MANAGEMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Limitations for--		Features affecting--			
	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
At---------- Atsion	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, too sandy.	Wetness, droughty, rooting depth.
BoB, BoC---------- Boonton	Severe: piping.	Severe: no water.	Percs slowly, slope.	Wetness, percs slowly, rooting depth.	Erodes easily, wetness.	Erodes easily, rooting depth.
BoD---------- Boonton	Severe: piping.	Severe: no water.	Percs slowly, slope.	Wetness, percs slowly, rooting depth.	Slope, erodes easily, wetness.	Slope, erodes easily, rooting depth.
BUB*: Boonton----------	Severe: piping.	Severe: no water.	Percs slowly, slope.	Wetness, percs slowly, rooting depth.	Erodes easily, wetness.	Erodes easily, rooting depth.
Urban land.						
ChA---------- Chalfont	Severe: piping, wetness.	Severe: no water.	Percs slowly, frost action.	Wetness, percs slowly, rooting depth.	Erodes easily, wetness, rooting depth.	Wetness, erodes easily, rooting depth.
ChB---------- Chalfont	Severe: piping, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Wetness, percs slowly, slope.	Erodes easily, wetness, rooting depth.	Wetness, erodes easily, rooting depth.
DnA, DnC---------- Downer	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty, rooting depth.
DoB---------- Downer	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, soil blowing.	Too sandy, soil blowing.	Droughty, rooting depth.
DTB*: Downer----------	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty, rooting depth.
Urban land.						
DTD*: Downer----------	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Slope, too sandy, soil blowing.	Slope, droughty, rooting depth.
Urban land.						
DUA*: Dunellen----------	Severe: piping.	Severe: no water.	Deep to water	Favorable------	Favorable------	Favorable.
Urban land.						

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
DvA---------- Dunellen Variant	Severe: seepage.	Severe: no water.	Deep to water	Droughty-------	Too sandy------	Droughty.
DvB---------- Dunellen Variant	Severe: seepage.	Severe: no water.	Deep to water	Droughty, slope.	Too sandy------	Droughty.
DWA*: Dunellen Variant-	Severe: seepage.	Severe: no water.	Deep to water	Droughty-------	Too sandy------	Droughty.
Urban land.						
Ek---------- Elkton	Severe: thin layer, wetness.	Severe: slow refill.	Percs slowly, frost action.	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
EoA---------- Ellington Variant	Severe: piping, wetness.	Severe: depth to rock.	Depth to rock, frost action.	Wetness, depth to rock.	Depth to rock, wetness.	Wetness, depth to rock.
EoB---------- Ellington Variant	Severe: piping, wetness.	Severe: depth to rock.	Depth to rock, frost action, slope.	Wetness, depth to rock, slope.	Depth to rock, wetness.	Wetness, depth to rock.
ESA*: Ellington Variant	Severe: piping, wetness.	Severe: depth to rock.	Depth to rock, frost action.	Wetness, depth to rock.	Depth to rock, wetness.	Wetness, depth to rock.
Urban land.						
EvB, EvC---------- Evesboro	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
EvD---------- Evesboro	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Slope, too sandy, soil blowing.	Slope, droughty.
Fa, Fb---------- Fallsington	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Frost action, cutbanks cave.	Wetness--------	Erodes easily, wetness, too sandy.	Wetness, erodes easily.
Fd---------- Fallsington Variant	Severe: seepage, wetness, piping.	Cutbanks cave	Percs slowly, frost action, flooding.	Wetness, percs slowly, frost action.	Wetness, percs slowly.	Wetness, percs slowly.
FrB---------- Fort Mott	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
HaA---------- Haledon	Severe: piping, wetness.	Severe: no water.	Percs slowly, frost action.	Wetness, percs slowly, rooting depth.	Large stones, erodes easily.	Large stones, wetness.
HaB---------- Haledon	Severe: piping, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Wetness, percs slowly, rooting depth.	Large stones, erodes easily.	Large stones, wetness.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
HBB*: Haledon	Severe: piping, wetness.	Severe: no water.	Percs slowly, frost action.	Wetness, percs slowly, rooting depth.	Large stones, erodes easily.	Large stones, wetness.
Urban land.						
HcA--- Haledon Variant	Severe: piping, wetness.	Severe: no water.	Frost action	Wetness, rooting depth.	Erodes easily, wetness.	Erodes easily, wetness, rooting depth.
HeA--- Hammonton	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Frost action, cutbanks cave.	Wetness, droughty, fast intake.	Wetness, too sandy, soil blowing.	Droughty, rooting depth.
HlA--- Hammonton	Severe: piping.	Severe: no water.	Frost action	Wetness, droughty, fast intake.	Wetness, soil blowing.	Droughty.
HmA--- Hammonton	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Frost action, cutbanks cave.	Wetness, droughty.	Wetness, too sandy, soil blowing.	Droughty, rooting depth.
HoA--- Holmdel	Severe: piping, wetness.	Severe: cutbanks cave.	Favorable	Wetness, soil blowing.	Wetness, soil blowing.	Severe: wetness.
HU*. Humaquepts						
KeA--- Keyport	Moderate: piping, wetness.	Severe: no water.	Percs slowly, frost action.	Wetness, erodes easily.	Erodes easily, wetness.	Erodes easily, percs slowly.
KeB--- Keyport	Moderate: piping, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Wetness, percs slowly, slope.	Erodes easily, wetness.	Erodes easily, percs slowly.
KeD--- Keyport	Moderate: piping, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Wetness, percs slowly, slope.	Slope, erodes easily, wetness.	Slope, erodes easily, percs slowly.
KfA--- Keyport	Moderate: piping, wetness.	Severe: no water.	Percs slowly, frost action.	Wetness, erodes easily.	Erodes easily, wetness.	Erodes easily, percs slowly.
KfB, KfC--- Keyport	Moderate: piping, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Wetness, percs slowly, slope.	Erodes easily, wetness.	Erodes easily, percs slowly.
KfD--- Keyport	Moderate: piping, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Wetness, percs slowly, slope.	Slope, erodes easily, wetness.	Slope, erodes easily, percs slowly.
KGB*: Keyport---	Moderate: piping, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Wetness, percs slowly, slope.	Erodes easily, wetness.	Erodes easily, percs slowly.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
KGB*: Urban land.						
KlA---- Klej	Severe: seepage, piping, wetness.	Severe: slow refill, cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, too sandy.	Droughty.
KmA---- Klej	Severe: seepage, piping.	Severe: no water.	Cutbanks cave	Wetness, fast intake.	Not needed-----	Not needed.
KUA*: Klej clayey substratum------	Severe: seepage, piping.	Severe: no water.	Cutbanks cave	Wetness, fast intake.	Not needed-----	Not needed.
Urban land.						
KvB---- Klinesville	Severe: seepage.	Severe: no water.	Deep to water	Droughty, depth to rock, slope.	Depth to rock	Droughty, depth to rock.
KvD, KvE---- Klinesville	Severe: seepage.	Severe: no water.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, droughty, depth to rock.
KWB*: Klinesville------	Severe: seepage.	Severe: no water.	Deep to water	Droughty, depth to rock.	Depth to rock	Droughty, depth to rock.
Urban land.						
LaA---- Lakehurst	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, too sandy, soil blowing.	Droughty.
LeB---- Lakewood	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
LnA---- Lansdowne	Severe: piping.	Severe: no water.	Percs slowly, frost action.	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
LnB---- Lansdowne	Severe: piping.	Severe: no water.	Percs slowly, frost action, slope.	Wetness, percs slowly, slope.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
LUA*: Lansdowne--------	Severe: piping.	Severe: no water.	Percs slowly, frost action.	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
Urban land.						
LvA---- Lansdowne Variant	Severe: thin layer.	Severe: no water.	Percs slowly, depth to rock, frost action.	Wetness, percs slowly, depth to rock.	Erodes easily, depth to rock, wetness.	Wetness, erodes easily, depth to rock.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Ma---------- Manahawkin	Severe: excess humus, ponding.	Severe: slow refill, cutbanks cave.	Ponding, flooding, frost action.	Ponding, flooding.	Ponding--------	Wetness.
MeA---------- Matapeake	Severe: seepage, piping.	Severe: no water.	Deep to water	Favorable------	Erodes easily, too sandy.	Erodes easily.
MeB---------- Matapeake	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope----------	Erodes easily, too sandy.	Erodes easily.
MgA---------- Mattapex	Severe: seepage, piping, wetness.	Severe: slow refill, cutbanks cave.	Frost action, cutbanks cave.	Wetness, erodes easily.	Erodes easily, wetness.	Erodes easily.
MgB---------- Mattapex	Severe: seepage, piping, wetness.	Severe: slow refill, cutbanks cave.	Frost action, slope, cutbanks cave.	Wetness, slope, erodes easily.	Erodes easily, wetness.	Erodes easily.
MoA---------- Mount Lucas	Severe: piping, wetness.	Severe: no water.	Percs slowly, frost action.	Wetness, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
MoB---------- Mount Lucas	Severe: piping, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Wetness, percs slowly, slope.	Wetness, percs slowly.	Wetness, percs slowly.
MsB---------- Mount Lucas	Severe: piping, wetness.	Severe: no water.	Percs slowly, frost action.	Wetness, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
Mu---------- Mullica	Severe: seepage, piping, wetness.	Severe: slow refill, cutbanks cave.	Frost action, cutbanks cave.	Wetness, droughty.	Wetness, too sandy.	Wetness, droughty.
NaA---------- Nixon	Severe: piping.	Severe---------	Deep to water	Favorable------	Favorable------	Favorable.
NaB---------- Nixon	Severe: piping.	Severe---------	Deep to water	Slope----------	Favorable------	Favorable.
NCB*: Nixon----------	Severe: piping.	Severe---------	Deep to water	Favorable------	Favorable------	Favorable.
Urban land.						
NfA, NfB---------- Nixon Variant	Severe: piping, wetness.	Moderate: deep to water.	Frost action, cutbanks cave.	Wetness--------	Not needed-----	Wetness, erodes easily.
NGA*: Nixon Variant----	Severe: piping, wetness.	Moderate: deep to water.	Frost action, cutbanks cave.	Wetness--------	Not needed-----	Wetness, erodes easily.
Urban land.						

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Pa---------- Parsippany	Severe: wetness.	Severe: slow refill, cutbanks cave.	Percs slowly, frost action.	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
Pb---------- Parsippany	Severe: wetness.	Severe: slow refill, cutbanks cave.	Percs slowly, flooding, frost action.	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
Pc---------- Parsippany Variant	Severe: seepage, piping, wetness.	Severe: slow refill, cutbanks cave.	Percs slowly, frost action, cutbanks cave.	Wetness, droughty, percs slowly.	Erodes easily, wetness, too sandy.	Wetness, erodes easily, droughty.
PeA---------- Pemberton	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, too sandy, soil blowing.	Wetness, droughty.
PfA---------- Penn	Severe: piping.	Severe: no water.	Deep to water	Depth to rock	Depth to rock	Depth to rock.
PfB---------- Penn	Severe: piping.	Severe: no water.	Deep to water	Depth to rock, slope.	Depth to rock	Depth to rock.
PhD---------- Phalanx	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake, cemented pan.	Slope, large stones, cemented pan.	Large stones, slope, droughty.
PL*, PM*. Pits						
PN*, PO*, PW*. Psamments						
ReA---------- Reaville	Severe: thin layer, piping, wetness.	Severe: slow refill, depth to rock.	Percs slowly, depth to rock, frost action.	Wetness, depth to rock, erodes easily.	Depth to rock, wetness, percs slowly.	Depth to rock, wetness, percs slowly.
ReB---------- Reaville	Severe: thin layer, piping, wetness.	Severe: slow refill, depth to rock.	Percs slowly, depth to rock, slope.	Wetness, depth to rock, slope.	Depth to rock, wetness, percs slowly.	Depth to rock, wetness, percs slowly.
RFA*: Reaville---------	Severe: thin layer, piping, wetness.	Severe: slow refill, depth to rock.	Percs slowly, depth to rock, frost action.	Wetness, depth to rock, erodes easily.	Depth to rock, wetness, percs slowly.	Depth to rock, wetness, percs slowly.
Urban land.						
Rh---------- Reaville Variant	Severe: piping, wetness.	Severe: slow refill, depth to rock.	Depth to rock, frost action.	Wetness, depth to rock, rooting depth.	Depth to rock, erodes easily, wetness.	Wetness, erodes easily, depth to rock.
Ro---------- Rowland	Severe: piping, wetness.	Severe: slow refill, cutbanks cave.	Flooding, frost action.	Wetness, erodes easily, flooding.	Erodes easily, wetness.	Wetness, erodes easily.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
SaA, SaB, SaC----- Sassafras	Severe: piping.	Severe: no water.	Deep to water	Favorable------	Erodes easily	Erodes easily.
SgB, SgC---------- Sassafras	Severe: piping.	Severe: no water.	Deep to water	Slope----------	Erodes easily	Erodes easily.
SgD---------- Sassafras	Severe: piping.	Severe: no water.	Deep to water	Slope----------	Slope, erodes easily.	Slope, erodes easily.
SlA, SlB---------- Sassafras	Severe: piping.	Severe: no water.	Deep to water	Favorable------	Erodes easily	Erodes easily.
SMB*: Sassafras--------	Severe: piping.	Severe: no water.	Deep to water	Favorable------	Erodes easily	Erodes easily.
Urban land.						
SrA---------- Shrewsbury	Severe: seepage, piping, wetness.	Severe: slow refill, cutbanks cave.	Frost action, cutbanks cave.	Wetness--------	Wetness, too sandy.	Wetness.
SU*: Sulfaquents.						
Sulfihemists.						
TnB---------- Tinton	Severe: seepage, piping.	Severe: no water.	Deep to water	Soil blowing, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
UB*, UC*, UD*. Udorthents						
UL*. Urban land						
Wa---------- Watchung	Severe: hard to pack, wetness.	Severe: slow refill.	Percs slowly, frost action.	Wetness, percs slowly.	Erodes easily, wetness.	Wetness, erodes easily.
WdA---------- Woodstown	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Frost action, cutbanks cave.	Wetness--------	Erodes easily, wetness.	Erodes easily, droughty.
WdB---------- Woodstown	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Frost action, slope, cutbanks cave.	Wetness, slope.	Erodes easily, wetness.	Erodes easily, droughty.
WkA, WkB---------- Woodstown	Severe: thin layer, wetness.	Severe: slow refill, cutbanks cave.	Cutbanks cave	Wetness--------	Wetness--------	Favorable.
WlA---------- Woodstown	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Frost action, cutbanks cave.	Wetness--------	Erodes easily, wetness.	Erodes easily, droughty.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
W1B---------- Woodstown	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Frost action, slope, cutbanks cave.	Wetness, slope.	Erodes easily, wetness.	Erodes easily, droughty.
WU*: Woodstown--------	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Frost action, cutbanks cave.	Wetness--------	Erodes easily, wetness.	Erodes easily, droughty.
Urban land.						

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--ENGINEERING INDEX PROPERTIES

(The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated)

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
At---------- Atsion	0-16	Sand----------	SP-SM, SM	A-3, A-1-B, A-2-4	0	95-100	90-100	45-80	5-35	---	NP
	16-22	Loamy sand, sand, sandy loam.	SM, SP-SM	A-2-4, A-3, A-1-B, A-4	0	95-100	85-100	40-75	5-40	---	NP
	22-60	Sand, loamy sand	SM, SM-SC, SP-SM	A-2-4, A-3, A-1-B	0	95-100	85-100	40-75	5-30	<20	NP-7
BoB---------- Boonton	0-10	Loam----------	ML, CL, SM, SC	A-4, A-2	0-10	80-95	75-90	50-90	30-80	---	---
	10-33	Fine sandy loam, gravelly fine sandy loam, gravelly silt loam.	ML, CL, SM, SC	A-2, A-4, A-1	0-10	85-100	50-95	35-80	20-55	20-30	3-10
	33-60	Gravelly sandy loam, gravelly loamy sand, fine sandy loam.	SM, SC	A-2, A-4	0-10	80-95	50-95	45-65	25-40	20-30	3-10
BoC---------- Boonton	0-8	Loam----------	ML, CL, SM, SC	A-4, A-2	0-10	80-95	75-90	50-90	30-80	---	---
	8-33	Fine sandy loam, gravelly fine sandy loam, gravelly silt loam.	ML, CL, SM, SC	A-2, A-4, A-1	0-10	85-100	50-95	35-80	20-55	20-30	3-10
	33-60	Gravelly sandy loam, gravelly loamy sand, fine sandy loam.	SM, SC	A-2, A-4	0-10	80-95	50-95	45-65	25-40	20-30	3-10
BoD---------- Boonton	0-7	Loam----------	ML, CL, SM, SC	A-4, A-2	0-10	80-95	75-90	50-90	30-80	---	---
	7-27	Fine sandy loam, gravelly fine sandy loam, gravelly silt loam.	ML, CL, SM, SC	A-2, A-4, A-1	0-10	85-100	50-95	35-80	20-55	20-30	3-10
	27-60	Gravelly sandy loam, gravelly loamy sand, fine sandy loam.	SM, SC	A-2, A-4	0-10	80-95	50-95	45-65	25-40	20-30	3-10

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
BUB*:											
Boonton	0-10	Loam	ML, CL, SM, SC	A-4, A-2	0-10	80-95	75-90	50-90	30-80	---	---
	10-33	Fine sandy loam, gravelly fine sandy loam, gravelly silt loam.	ML, CL, SM, SC	A-2, A-4, A-1	0-10	85-100	50-95	35-80	20-55	20-30	3-10
	33-60	Gravelly sandy loam, gravelly loamy sand, fine sandy loam.	SM, SC	A-2, A-4	0-10	80-95	50-95	45-65	25-40	20-30	3-10
Urban land.											
ChA, ChB	0-6	Silt loam	ML	A-4	0-5	95-100	95-100	95-100	85-95	---	---
Chalfont	6-26	Silt loam, silty clay loam.	ML, CL	A-4, A-6	0-5	95-100	95-100	95-100	85-95	25-35	2-11
	26-50	Silt loam, shaly silty clay loam, very shaly loam.	ML, GM, CL, SM	A-4, A-6	0-15	55-100	50-95	45-75	40-70	25-35	2-11
	50-60	Shaly silt loam, shaly loam, very shaly loam.	ML, GM, SM	A-4, A-2	0-10	50-80	45-75	40-65	30-60	25-35	2-7
DnA, DnC	0-13	Loamy sand	SM, SC, SP-SM	A-2-4, A-1-B	0	80-100	75-100	40-75	10-30	<17	NP-2
Downer	13-30	Sandy loam, gravelly sandy loam.	SM, SC	A-2-4, A-4, A-1-B	0	80-100	75-100	45-70	20-40	<25	NP-8
	30-60	Stratified gravelly sand to sandy clay loam.	SC, SM, SP-SM	A-2-4, A-1-B, A-3, A-4	0	75-100	70-100	35-90	5-55	<28	NP-10
DoB	0-13	Sandy loam	SM	A-2-4, A-1-B, A-4	0	80-100	75-100	50-70	25-45	<19	NP-4
Downer	13-30	Sandy loam, gravelly sandy loam.	SM, SC	A-2-4, A-4, A-1-B	0	80-100	75-100	45-70	20-40	<25	NP-8
	30-60	Stratified gravelly sand to sandy clay loam.	SC, SM, SP-SM	A-2-4, A-1-B, A-3, A-4	0	75-100	70-100	35-90	5-55	<28	NP-10
DTB*:											
Downer	0-13	Loamy sand	SM, SC, SP-SM	A-2-4, A-1-B	0	80-100	75-100	40-75	10-30	<17	NP-2
	13-30	Sandy loam, gravelly sandy loam.	SM, SC	A-2-4, A-4, A-1-B	0	80-100	75-100	45-70	20-40	<25	NP-8
	30-60	Stratified gravelly sand to sandy clay loam.	SC, SM, SP-SM	A-2-4, A-1-B, A-3, A-4	0	75-100	70-100	35-90	5-55	<28	NP-10
Urban land.											

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
DTD*:											
Downer----------	0-10	Loamy sand-------	SM, SC, SP-SM	A-2-4, A-1-B	0	80-100	75-100	40-75	10-30	<17	NP-2
	10-25	Sandy loam, gravelly sandy loam.	SM, SC	A-2-4, A-4, A-1-B	0	80-100	75-100	45-70	20-40	<25	NP-8
	25-60	Stratified gravelly sand to sandy clay loam.	SC, SM, SP-SM	A-2-4, A-1-B, A-3, A-4	0	75-100	70-100	35-90	5-55	<28	NP-10
Urban land.											
DUA*:											
Dunellen--------	0-14	Sandy loam-------	SM, SC, ML, CL	A-2, A-4	0-2	95-100	75-100	60-80	30-70	20-30	3-10
	14-40	Sandy loam, loam, gravelly sandy loam.	SM, SC, ML, CL	A-2, A-4, A-1	0-2	95-100	60-95	40-80	20-75	20-30	3-10
	40-60	Stratified gravelly sand to loamy sand.	SM, SP-SM	A-2, A-1	0-10	70-80	40-65	30-55	10-25	<20	NP
Urban land.											
DvA, DvB---------	0-11	Sandy loam-------	SM, SC	A-2, A-4	0	95-100	90-100	60-70	30-40	20-30	3-10
Dunellen Variant	11-25	Sandy loam, loam, gravelly sandy loam.	SM, SC, ML, CL	A-1, A-2	0	75-100	65-95	40-90	20-75	20-30	3-10
	25-60	Stratified gravelly sand to sandy loam.	GM, GC, SM, SC	A-1, A-2	0-3	65-95	55-85	30-70	5-40	<20	NP
DWA*:											
Dunellen Variant	0-11	Sandy loam-------	SM, SC	A-2, A-4	0	95-100	90-100	60-70	30-40	20-30	3-10
	11-25	Sandy loam, loam, gravelly sandy loam.	SM, SC, ML, CL	A-1, A-2	0	75-100	65-95	40-90	20-75	20-30	3-10
	25-60	Stratified gravelly sand to sandy loam.	GM, GC, SM, SC	A-1, A-2	0-3	65-95	55-85	30-70	5-40	<20	NP
Urban land.											
Ek----------	0-8	Loam----------	SM, SC, ML, CL	A-4, A-6	0	100	100	70-100	35-95	<35	NP-12
Elkton	8-35	Silty clay, clay loam, clay.	CL, CH	A-6, A-7	0	100	100	85-100	70-95	31-62	11-33
	35-60	Silty clay loam, fine sandy loam, clay.	SM, ML, CL, CH	A-2, A-4, A-6, A-7	0	100	100	70-100	30-95	<60	NP-32
EoA, EoB---------	0-20	Sandy loam-------	SM, SC	A-4, A-2	0-3	90-100	80-95	50-70	25-40	20-30	3-10
Ellington Variant	20-36	Sandy loam, loam, silt loam.	ML, CL, SM, SC	A-4, A-2	0-3	90-100	80-95	50-90	25-85	20-30	3-10
	36-40	Weathered bedrock	---	---	---	---	---	---	---	---	---
ESA*:											
Ellington Variant--------	0-20	Sandy loam-------	SM, SC	A-4, A-2	0-3	90-100	80-95	50-70	25-40	20-30	3-10
	20-36	Sandy loam, loam, silt loam.	ML, CL, SM, SC	A-4, A-2	0-3	90-100	80-95	50-90	25-85	20-30	3-10
	36-40	Weathered bedrock	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
ESA*: Urban land.											
EvB, EvC, EvD---- Evesboro	0-40	Sand----------	SP, SP-SM	A-1, A-3, A-2	0	90-100	85-100	40-90	0-12	---	NP
	40-60	Sand, loamy sand	SP, SP-SM	A-1, A-3, A-2	0	90-100	85-100	40-90	0-12	---	NP
	30-72	Sand, gravelly sand, sandy loam.	SP, SM, SC, SW	A-2, A-3	0	65-100	60-100	35-95	0-35	<30	NP-8
Fa---------- Fallsington	0-16	Sandy loam-------	SM, CL-ML, ML	A-2, A-4	0	100	100	65-90	30-70	<19	NP-5
	16-26	Sandy loam, loam, sandy clay loam.	SM, SC, CL, ML	A-2, A-4, A-6	0	100	100	65-85	30-55	<30	NP-12
	26-60	Loamy sand, sand, sandy loam.	SM, SP-SM	A-2, A-3	0	95-100	90-100	50-65	5-35	---	NP
Fb---------- Fallsington	0-16	Loam----------	SM, CL-ML, ML	A-2, A-4	0	100	100	65-90	30-70	<19	NP-5
	16-27	Sandy loam, loam, sandy clay loam.	SM, SC, CL, ML	A-2, A-4, A-6	0	100	100	65-85	30-55	<30	NP-12
	27-60	Loamy sand, sand, sandy loam.	SM, SP-SM	A-2, A-3	0	95-100	90-100	50-65	5-35	---	NP
Fd---------- Fallsington Variant	0-5	Loam----------	ML	A-4	0	95-100	90-100	75-95	55-75	<20	NP-5
	5-26	Silty clay loam	ML, CL	A-6, A-7-6	0	95-100	95-100	90-100	80-95	34-45	14-22
	26-30	Sandy clay loam	ML, CL, SM, SC	A-4, A-6	0	95-100	95-100	75-90	35-55	19-31	3-12
	30-60	Loamy sand, sandy loam, gravelly sandy loam.	SM, SC, SM-SC	A-1, A-2, A-4	0	75-100	65-90	40-75	15-40	<25	NP-8
FrB---------- Fort Mott	0-25	Loamy sand-------	SM, SP-SM	A-2	0	90-100	85-100	50-90	10-25	---	NP
	25-35	Sandy loam, sandy clay loam.	SM, SC, SM-SC	A-2, A-4, A-6	0	90-100	80-100	50-90	25-45	15-35	NP-15
	35-60	Stratified sand to loamy sand.	SM, SP, SP-SM, SC	A-1, A-2, A-3	0	90-100	75-100	40-80	5-35	<40	NP-12
HaA---------- Haledon	0-8	Loam----------	ML, CL	A-4	0-10	85-90	75-90	65-90	55-85	20-30	3-10
	8-24	Cobbly fine sandy loam, silt loam, gravelly loam.	ML, CL, SM, SC	A-2, A-4	0-20	85-100	75-95	50-85	30-75	20-30	3-10
	24-60	Cobbly sandy loam, fine sandy loam, gravelly loam.	ML, CL, SM, SC	A-2, A-4	0-20	80-100	75-95	45-80	30-60	20-30	3-10
	60-64	Gravelly sandy loam, sandy loam, loam.	SM, SC, ML, CL	A-2, A-4	0-15	75-85	60-80	40-75	25-55	10-20	NP-8

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
HaB---------- Haledon	0-8	Loam----------	ML, CL	A-4	0-10	85-90	75-90	65-90	55-85	20-30	3-10
	8-24	Cobbly fine sandy loam, silt loam, gravelly loam.	ML, CL, SM, SC	A-2, A-4	0-20	85-100	75-95	50-85	30-75	20-30	3-10
	24-60	Cobbly sandy loam, fine sandy loam, gravelly loam.	ML, CL, SM, SC	A-2, A-4	0-20	80-100	75-95	45-80	30-60	20-30	3-10
	60-70	Gravelly sandy loam, sandy loam, loam.	SM, SC, ML, CL	A-2, A-4	0-15	75-85	60-80	40-75	25-55	10-20	NP-8
HBB*:											
Haledon---------	0-8	Loam----------	ML, CL	A-4	0-10	85-90	75-90	65-90	55-85	20-30	3-10
	8-24	Cobbly fine sandy loam, silt loam, gravelly loam.	ML, CL, SM, SC	A-2, A-4	0-20	85-100	75-95	50-85	30-75	20-30	3-10
	24-60	Cobbly sandy loam, fine sandy loam, gravelly loam.	ML, CL, SM, SC	A-2, A-4	0-20	80-100	75-95	45-80	30-60	20-30	3-10
	60-70	Gravelly sandy loam, sandy loam, loam.	SM, SC, ML, CL	A-2, A-4	0-15	75-85	60-80	40-75	25-55	10-20	NP-8
Urban land.											
HcA---------- Haledon Variant	0-7	Silt loam--------	ML, CL	A-4	0-3	90-100	80-95	70-90	50-70	20-30	5-10
	7-16	Loam, silty clay loam.	ML, CL	A-4	0-3	90-100	80-95	70-95	50-90	20-30	5-10
	16-22	Loam, silty clay loam.	ML, CL	A-4	0-3	90-100	80-95	70-95	50-90	20-30	5-10
	22-60	Loam----------	ML, CL	A-4	0-3	90-100	75-95	65-90	45-70	20-30	5-10
HeA---------- Hammonton	0-18	Loamy sand-------	SM	A-2-4, A-1-B, A-3	0	90-100	85-100	40-75	10-30	---	NP
	18-30	Sandy loam, gravelly sandy loam.	SM, SC	A-2-4, A-1-B, A-4	0	80-100	70-100	40-90	20-40	<25	NP-8
	30-60	Stratified gravelly sand to sandy loam.	SM, SP-SM	A-2-4, A-1-B, A-4, A-3	0	60-100	45-100	20-70	5-40	<16	NP-2
HlA---------- Hammonton	0-18	Loamy sand-------	SM, SP-SM	A-2-4, A-1-B	0	90-100	85-100	40-75	10-30	---	NP
	18-48	Sandy loam, gravelly sandy loam.	SM, SC	A-2-4, A-1-B, A-4	0	80-100	70-100	40-70	20-40	<28	NP-10
	48-60	Clay, sandy clay	CL, ML	A-6, A-7-6	0	95-100	95-100	80-100	50-90	30-50	10-30
HmA---------- Hammonton	0-18	Sandy loam-------	SM	A-2-4, A-1-B, A-4	0	90-100	85-100	50-70	25-40	<18	NP-3
	18-30	Sandy loam, gravelly sandy loam.	SM, SC	A-2-4, A-1-B, A-4	0	80-100	70-100	40-90	20-40	<25	NP-8
	30-60	Stratified gravelly sand to sandy loam.	SM, SP-SM	A-2-4, A-1-B, A-4, A-3	0	60-100	45-100	20-70	5-40	<16	NP-2

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
HoA---------- Holmdel	0-10	Fine sandy loam	SM, SC, ML, CL	A-2-4, A-4	0	98-100	98-100	60-95	30-75	8-25	3-7
	10-42	Sandy loam, sandy clay loam, loam.	SM, SC, ML, CL	A-2-4, A-4, A-6, A-2-6	0	98-100	98-100	60-95	30-75	20-40	5-20
	42-60	Stratified fine sandy loam to sand.	SM, SM-SC, SP-SM	A-2-4, A-3, A-4	0	95-100	90-100	50-85	5-50	<20	NP-5
HU*. Humaquepts											
KeA, KeB, KeD---- Keyport	0-15	Sandy loam-------	SM, SC, ML, CL	A-2-4, A-4	0	95-100	95-100	60-85	30-55	<26	NP-10
	15-60	Silty clay loam, clay loam, clay.	ML, CL, MH, CH	A-6, A-7-6	0	95-100	95-100	85-100	70-95	35-60	15-35
KfA, KfB, KfC, KfD---------- Keyport	0-8	Loam-------------	ML, CL, SC, SM	A-4, A-2-4, A-6, A-2-6	0	95-100	95-100	80-100	30-55	20-30	3-12
	8-60	Silty clay loam, clay loam, clay.	ML, CL, MH, CH	A-6, A-7-6	0	95-100	95-100	85-100	70-95	35-60	15-35
KGB*: Keyport---------	0-8	Loam-------------	ML, CL, SC, SM	A-4, A-2-4, A-6, A-2-6	0	95-100	95-100	80-100	30-55	20-30	3-12
	8-60	Silty clay loam, clay loam, clay.	ML, CL, MH, CH	A-6, A-7-6	0	95-100	95-100	85-100	70-95	35-60	15-35
KlA---------- Klej	0-6	Loamy sand-------	SM	A-2, A-4	0	100	95-100	50-95	15-45	<20	NP
	6-60	Sand, loamy sand	SP-SM, SM	A-1, A-2	0	90-100	75-100	40-80	5-35	<20	NP
	60-64	Sandy loam, sandy clay loam, sandy clay.	SM, SC, ML, CL	A-2, A-4, A-6, A-7	0	90-100	75-100	45-95	20-60	<45	NP-18
KmA---------- Klej	0-6	Loamy sand-------	SM, SP-SM	A-2	0	100	95-100	50-75	5-30	<20	NP
	6-40	Sand, loamy sand	SM, SP-SM	A-1, A-2	0	90-100	90-100	45-80	5-30	<20	NP
	40-60	Clay-------------	CL, CH	A-6, A-7	0	95-100	90-100	80-100	70-90	<55	11-30
KUA*: Klej----------	0-6	Loamy sand-------	SM, SP-SM	A-2	0	100	95-100	50-75	5-30	<20	NP
	6-40	Sand, loamy sand	SM, SP-SM	A-1, A-2	0	90-100	90-100	45-80	5-30	<20	NP
	40-60	Clay-------------	CL, CH	A-6, A-7	0	95-100	90-100	80-100	70-90	<55	11-30
Urban land.											
KvB, KvD, KvE---- Klinesville	0-8	Shaly loam-------	GM, SM	A-2, A-4	0-10	55-85	45-60	35-50	25-40	---	---
	8-12	Shaly silt loam, very shaly silt loam.	GM, GP, SM, SP	A-2, A-1, A-4	0-10	25-75	15-55	10-50	4-40	20-35	NP-9
	12-16	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
KWB*:											
Klinesville-----	0-8	Shaly loam-------	GM, SM	A-2, A-4	0-10	55-85	45-60	35-50	25-40	---	---
	8-12	Shaly silt loam, very shaly silt loam.	GM, GP, SM, SP	A-2, A-1, A-4	0-10	25-75	15-55	10-50	4-40	20-35	NP-9
	12-16	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Urban land.											
LaA---------- Lakehurst	0-21	Sand----------	SP, SM, SP-SM	A-1, A-2, A-3	0	95-100	95-100	50-80	0-15	---	NP
	21-60	Sand, fine sand, loamy sand.	SP, SM, SP-SM	A-1, A-2, A-3	0	95-100	95-100	50-80	0-30	---	NP
LeB---------- Lakewood	0-20	Sand----------	SP, SP-SM	A-1, A-2, A-3	0	95-100	90-100	40-90	0-12	---	NP
	20-60	Sand, fine sand, loamy sand.	SP, SM, SP-SM	A-1, A-2, A-3	0	85-100	80-100	40-85	0-30	---	NP
	60-64	Sand, gravelly sand, sandy loam.	SP, SM, SM-SC	A-1, A-2, A-3	0	85-100	75-100	40-90	0-35	<20	NP-5
LnA, LnB--------- Lansdowne	0-7	Silt loam--------	CL	A-4, A-6	0-5	95-100	85-100	85-90	65-90	30-40	8-15
	7-50	Silty clay loam, silty clay, clay.	CL, CH, MH	A-6, A-7	0-5	95-100	85-100	80-100	60-95	35-60	15-28
	50-60	Shaly loam, clay loam, sandy loam.	ML, CL, SM, SC	A-4, A-6	5-10	70-95	70-90	65-75	40-70	15-35	3-15
	60-64	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
LUA*:											
Lansdowne-------	0-7	Silt loam--------	CL	A-4, A-6	0-5	95-100	85-100	85-90	65-90	30-40	8-15
	7-50	Silty clay loam, silty clay, clay.	CL, CH, MH	A-6, A-7	0-5	95-100	85-100	80-100	60-95	35-60	15-28
	50-60	Shaly loam, clay loam, sandy loam.	ML, CL, SM, SC	A-4, A-6	5-10	70-95	70-90	65-75	40-70	15-35	3-15
	60-64	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Urban land.											
LvA---------- Lansdowne Variant	0-9	Silt loam--------	ML, CL	A-4, A-6	0-5	95-100	90-100	80-95	65-85	25-40	3-15
	9-21	Silty clay loam, silty clay.	CL, ML, MH	A-6, A-7, A-4	0-5	95-100	90-100	85-95	75-90	30-55	10-25
	21-25	Silt loam--------	ML, CL	A-4, A-6	0-5	95-100	90-100	80-95	65-85	25-35	3-15
	25-29	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Ma---------- Manahawkin	0-30	Muck----------	Pt	A-8	---	---	---	---	---	---	---
	30-60	Sand, gravelly sand.	SW, SP, SP-SM, GW	A-1	0	40-100	35-100	20-50	4-10	---	NP

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
MeA, MeB--------- Matapeake	0-13	Silt loam--------	ML, SM, CL	A-4	0	100	100	80-100	45-80	20-33	3-9
	13-31	Silt loam, silty clay loam, loam.	CL	A-4, A-6	0	100	100	80-100	60-90	27-35	10-15
	31-60	Sandy loam, loamy sand, sand.	SM, SP-SM	A-2, A-4	0	95-100	90-100	55-70	5-40	<19	NP-3
MgA, MgB--------- Mattapex	0-10	Silt loam--------	ML, CL, SM, SC	A-4, A-6	0	100	100	70-100	45-90	18-33	3-12
	10-40	Silty clay loam, silt loam.	CL	A-4, A-6, A-7	0	100	100	90-100	70-95	24-45	7-21
	40-60	Fine sandy loam, loam, loamy sand.	SM, SC, CL, ML	A-2, A-4, A-6	0	95-100	90-100	45-95	15-75	<40	NP-18
MoA, MoB--------- Mount Lucas	0-6	Silt loam--------	ML	A-4	0-5	95-100	80-100	75-95	60-90	---	---
	6-30	Silt loam, gravelly silty clay loam, sandy clay loam.	ML, GM, SM	A-4, A-2, A-7, A-5	0-10	70-95	55-95	45-95	30-90	30-49	3-15
	30-60	Gravelly clay loam, gravelly loam, gravelly loamy sand.	SP-SM, SM, ML, GM	A-2, A-4, A-6, A-1	0-10	45-80	30-70	15-70	10-55	25-40	NP-11
MsB--------- Mount Lucas	0-6	Very stony silt loam.	ML, SM	A-4	3-10	75-100	55-75	50-70	35-55	---	---
	6-30	Silt loam, gravelly silty clay loam, sandy clay loam.	ML, GM, SM	A-4, A-2, A-7, A-5	0-10	70-95	55-95	45-95	30-90	30-49	3-15
	30-60	Gravelly clay loam, gravelly loam, gravelly loamy sand.	SP-SM, SM, ML, GM	A-2, A-4, A-6, A-1	0-10	45-80	30-70	15-70	10-55	25-40	NP-11
Mu--------- Mullica	0-7	Sandy loam-------	SM, SC, ML, CL	A-2-4, A-4	0	95-100	85-100	50-95	25-75	<27	NP-9
	7-28	Sandy loam, sandy clay loam.	SC, SM	A-2-4, A-4, A-6, A-2-6	0	70-100	80-100	50-75	25-45	18-30	3-13
	28-60	Stratified gravelly sand to sandy clay loam.	SM, SP-SM, SC	A-2-4, A-3, A-1-B, A-6	0	70-100	55-100	35-85	5-50	<20	NP-13
NaA, NaB--------- Nixon	0-11	Loam-------------	SM, SC, ML, CL	A-2, A-4	0-2	95-100	75-95	45-95	25-75	---	---
	11-30	Loam, sandy clay loam, gravelly sandy loam.	GM, SM, ML, CL	A-1, A-2, A-4	0-3	55-100	50-90	30-90	15-70	20-30	5-15
	30-40	Loamy sand, gravelly sandy loam.	GM, SM	A-1, A-2	0-5	55-100	50-90	30-70	15-30	<20	NP-8

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
NCB*:											
Nixon	0-11	Loam	SM, SC, ML, CL	A-2, A-4	0-2	95-100	75-95	45-95	25-75	---	---
	11-30	Loam, sandy clay loam, gravelly sandy loam.	GM, SM, ML, CL	A-1, A-2, A-4	0-3	55-100	50-90	30-90	15-70	20-30	5-15
	30-40	Loamy sand, gravelly sandy loam.	GM, SM	A-1, A-2	0-5	55-100	50-90	30-70	15-30	<20	NP-8
Urban land.											
NfA, NfB	0-16	Loam	SM, SC, ML, CL	A-2, A-4	0-2	90-100	75-95	45-70	25-55	---	---
Nixon Variant	16-38	Loam, sandy loam, gravelly sandy clay loam.	SM, SC, ML, CL	A-1, A-2, A-4, A-6	0-2	90-100	70-95	45-95	20-75	15-30	3-15
	38-60	Sandy loam, loamy sand, gravelly loamy sand.	SC, SM, SP-SM	A-1, A-2, A-4	0-2	90-100	45-95	25-65	10-40	<20	NP-8
NGA*:											
Nixon Variant	0-16	Loam	SM, SC, ML, CL	A-2, A-4	0-2	90-100	75-95	45-70	25-55	---	---
	16-38	Loam, sandy loam, gravelly sandy clay loam.	SM, SC, ML, CL	A-1, A-2, A-4, A-6	0-2	90-100	70-95	45-95	20-75	15-30	3-15
	38-60	Sandy loam, loamy sand, gravelly loamy sand.	SC, SM, SP-SM	A-1, A-2, A-4	0-2	90-100	45-95	25-65	10-40	<20	NP-8
Urban land.											
Pa	0-8	Silt loam	CL-ML, CL	A-6	0	95-100	95-100	90-100	75-85	30-45	8-15
Parsippany	8-46	Silty clay loam, clay loam, silty clay.	CL-ML, CL	A-6, A-7	0	95-100	95-100	90-100	75-95	35-45	10-20
	46-60	Stratified loamy sand to silt loam.	CL-ML, SM-SC, SM, CL	A-7, A-4, A-2, A-6	0	95-100	70-100	45-95	15-90	25-45	3-20
Pb	0-4	Silt loam	CL-ML, CL	A-6	0	95-100	95-100	90-100	75-85	30-45	8-15
Parsippany	4-48	Silty clay loam, clay loam, silty clay.	CL-ML, CL	A-6, A-7	0	95-100	95-100	90-100	75-95	35-45	10-20
	48-60	Stratified loamy sand to silt loam.	CL-ML, SM-SC, SM, CL	A-7, A-4, A-2, A-6	0	95-100	70-100	45-95	15-90	25-45	3-20
Pc	0-3	Silt loam	ML, CL	A-4, A-6, A-7	0	95-100	95-100	70-80	55-70	20-30	3-16
Parsippany Variant	3-23	Clay, silty clay, silty clay loam.	ML, CL, CH, MH	A-6, A-7	0	95-100	95-100	70-95	55-90	30-45	8-20
	23-60	Loamy sand, sand, sandy loam.	SM, SC	A-2, A-1, A-4	0	95-100	95-100	45-85	15-40	15-25	NP-10

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
PeA---------- Pemberton	0-28	Loamy sand-------	SM, SP-SM	A-2, A-3	0	100	100	80-100	5-20	---	NP
	28-45	Sandy loam, fine sandy loam, sandy clay loam.	SM, SC	A-2	0	100	100	90-100	25-35	25-40	3-10
	45-60	Stratified sand to clay.	SP-SM, CL, ML	A-2, A-4, A-6, A-7	0	100	95-100	70-95	10-80	<50	NP-30
PfA, PfB--------- Penn	0-8	Silt loam--------	ML	A-4	0-5	95-100	90-100	85-95	60-85	---	---
	8-20	Shaly silt loam, shaly loam, shaly silty clay loam.	ML, SM, GM	A-4, A-2	0-10	55-100	50-100	45-95	30-75	20-37	1-10
	20-32	Very shaly silt loam, very shaly loam.	ML, CL, SM, GM	A-4, A-2, A-1	0-15	35-100	20-100	15-95	15-70	20-35	3-10
	32-36	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
PhD---------- Phalanx	0-7	Loamy sand-------	SM, SP-SM	A-1-B, A-2-4, A-3	0	90-100	85-95	40-70	5-15	<19	NP-3
	7-30	Channery sandy loam, flaggy loamy sand, sandy clay loam.	SM, SC, SP-SM	A-1-B, A-2-4, A-4, A-6	5-30	60-85	15-70	25-70	10-40	<30	NP-12
	30-60	Sand, loamy sand, flaggy sand.	SP, SM, GM, GP-GM	A-1-B, A-2-4, A-3	0-30	35-100	20-100	15-75	2-25	<20	NP-2
PL*, PM*. Pits											
PN*, PO*, PW*. Psamments											
ReA, ReB--------- Reaville	0-10	Silt loam--------	ML	A-4	0-5	90-100	90-100	85-100	80-95	---	---
	10-22	Silt loam, shaly silt loam, shaly silty clay loam.	CL, GC, SC, CL-ML	A-4, A-6	0-15	65-90	55-85	45-75	40-75	25-39	5-15
	22-28	Shaly silt loam, very shaly silt loam, very shaly loam.	ML, GM, ML, CL-ML	A-2, A-4, A-1-B	0-40	55-80	40-75	30-70	20-65	25-35	5-10
	28-32	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
RFA*: Reaville--------	0-10	Silt loam--------	ML	A-4	0-5	90-100	90-100	85-100	80-95	---	---
	10-22	Silt loam, shaly silt loam, shaly silty clay loam.	CL, GC, SC, CL-ML	A-4, A-6	0-15	65-90	55-85	45-75	40-75	25-39	5-15
	22-28	Shaly silt loam, very shaly silt loam, very shaly loam.	ML, GM, ML, CL-ML	A-2, A-4, A-1-B	0-40	55-80	40-75	30-70	20-65	25-35	5-10
	28-32	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Urban land.											

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Rh---------- Reaville Variant	0-8	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0-2	90-100	90-100	70-95	70-85	---	---
	8-25	Silty clay loam, clay loam.	ML, CL, CH	A-4, A-6, A-7	0	90-100	90-100	85-100	70-95	30-55	8-20
	25-30	Shaly sandy clay loam.	ML, CL	A-4, A-6	0	75-100	60-70	55-70	50-65	20-40	3-20
	30-34	Weathered bedrock	---	---	---	---	---	---	---	---	---
Ro---------- Rowland	0-7	Silt loam--------	ML, SM	A-4	0-5	95-100	95-100	75-100	35-95	---	---
	7-40	Silt loam, loam, sandy clay loam.	ML, SM	A-4, A-7, A-6	0-5	95-100	95-100	75-100	35-95	24-45	NP-15
	40-50	Sandy clay, silt loam, gravelly silty clay loam.	ML, SM	A-4, A-6, A-7	0-10	90-100	70-100	65-100	35-95	25-50	3-17
	50-60	Stratified sand to gravel.	SM, GM, GC, SC	A-2, A-1	0-15	55-80	30-70	20-40	15-30	---	---
SaA, SaB, SaC---- Sassafras	0-17	Sandy loam-------	SM, ML, CL	A-2, A-4	0	85-100	80-100	50-95	25-65	12-32	NP-10
	17-37	Loam, sandy clay loam, sandy loam.	SM-SC, CL, ML	A-2, A-4, A-6	0	85-100	75-100	50-95	30-75	20-33	5-15
	37-60	Gravelly sandy loam, fine sandy loam, sand.	SP-SM, SC, SM	A-1, A-2, A-4	0	70-100	55-100	30-75	5-50	<26	NP-8
SgB, SgC, SgD---- Sassafras	0-17	Gravelly sandy loam.	SM, CL, ML	A-1, A-2, A-4	0	80-85	70-75	45-70	20-55	<32	NP-10
	17-37	Loam, sandy clay loam, sandy loam.	SM-SC, CL, ML	A-2, A-4, A-6	0	85-100	75-100	50-95	30-75	20-33	5-15
	37-60	Gravelly sandy loam, loamy sand, sand.	SP-SM, SC, SM	A-1, A-2, A-4	0	70-100	55-100	30-75	5-50	<26	NP-8
SlA, SlB--------- Sassafras	0-12	Loam-------------	SM, ML, CL	A-2, A-4	0	85-100	80-100	50-95	25-65	12-32	NP-10
	12-30	Loam, sandy clay loam, sandy loam.	SM-SC, CL, ML	A-2, A-4, A-6	0	85-100	75-100	50-95	30-75	20-33	5-15
	30-60	Gravelly sandy loam, fine sandy loam, sand.	SP-SM, SC, SM	A-1, A-2, A-4	0	70-100	55-100	30-75	5-50	<26	NP-8
SMB*: Sassafras-------	0-17	Loam-------------	SM, ML, CL	A-2, A-4	0	85-100	80-100	50-95	25-65	12-32	NP-10
	17-37	Loam, sandy clay loam, sandy loam.	SM-SC, CL, ML	A-2, A-4, A-6	0	85-100	75-100	50-95	30-75	20-33	5-15
	37-60	Gravelly sandy loam, fine sandy loam, sand.	SP-SM, SC, SM	A-1, A-2, A-4	0	70-100	55-100	30-75	5-50	<26	NP-8
Urban land.											
SrA---------- Shrewsbury	0-19	Sandy loam-------	SM, SC, ML, CL	A-2-4, A-4	0	95-100	95-100	60-95	30-75	<27	NP-9
	19-36	Sandy loam, sandy clay loam, clay loam.	SM, SC, ML, CL	A-2-6, A-4, A-6	0	95-100	95-100	65-100	35-80	25-40	7-18
	36-60	Stratified loamy sand to sandy loam.	SM, SC	A-2-4, A-4	0	90-100	90-100	60-95	15-45	<23	NP-8

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
SU*: Sulfaquents. Sulfihemists.											
TnB---------- Tinton	0-34	Loamy sand-------	SM, SP-SM	A-2, A-3	0	100	100	70-100	5-20	---	NP
	34-48	Fine sandy loam, sandy loam, sandy clay loam.	SM, SC, SM-SC	A-2, A-4, A-6	0	80-100	75-100	60-100	20-50	20-40	3-15
	48-60	Stratified sand to sandy loam.	SM, SP-SM, SM-SC	A-2, A-4	0	100	98-100	70-100	10-40	---	NP-6
UB*, UC*, UD*. Udorthents											
UL*. Urban land											
Wa---------- Watchung	0-8	Very stony silt loam.	ML	A-4, A-6, A-7	3-10	90-100	85-100	70-100	50-95	35-45	8-14
	8-27	Clay, silty clay, silty clay loam.	ML, CL, CH, MH	A-7	0-10	95-100	85-100	75-100	65-95	40-65	15-35
	27-60	Silt loam, silty clay loam, loam.	ML, CL	A-4, A-6, A-7	0-25	85-100	85-90	70-90	50-85	35-45	10-15
WdA, WdB--------- Woodstown	0-12	Sandy loam-------	SM, SC, ML, CL-ML	A-2, A-4, A-6	0	100	100	60-95	30-75	<34	NP-12
	12-36	Sandy clay loam, loam, sandy loam.	SM, CL-ML	A-2, A-4, A-6	0	100	70-100	45-90	25-60	<32	NP-12
	36-60	Sandy loam, loamy sand, gravelly sand.	SM, SP-SM	A-1, A-2, A-3	0	80-100	70-95	35-55	5-25	<26	NP-6
WkA, WkB--------- Woodstown	0-12	Sandy loam-------	SM, SM-SC	A-2, A-4	0	95-100	90-100	55-70	30-40	<25	NP-6
	12-36	Sandy loam, sandy clay loam.	SC, SM-SC, CL	A-4, A-6	0	95-100	90-100	55-90	35-55	<30	NP-15
	36-45	Loamy sand-------	SM, SC, SM-SC	A-2, A-4	0	95-100	90-100	50-75	15-30	<24	NP-10
	45-60	Sandy clay-------	SM, SC, ML, CL	A-4, A-6, A-7	0	95-100	90-100	80-90	35-55	30-50	10-30
W1A, W1B--------- Woodstown	0-12	Loam-------------	SM, SC, ML, CL-ML	A-2, A-4, A-6	0	100	100	60-95	30-75	<34	NP-12
	12-36	Sandy clay loam, loam, sandy loam.	SM, CL-ML	A-2, A-4, A-6	0	100	70-100	45-90	25-60	<32	NP-12
	36-60	Sandy loam, loamy sand, gravelly sand.	SM, SP-SM	A-1, A-2, A-3	0	80-100	70-95	35-55	5-25	<26	NP-6
WU*: Woodstown-------	0-12	Sandy loam-------	SM, SC, ML, CL-ML	A-2, A-4, A-6	0	100	100	60-95	30-75	<34	NP-12
	12-36	Sandy clay loam, loam, sandy loam.	SM, CL-ML	A-2, A-4, A-6	0	100	70-100	45-90	25-60	<32	NP-12
	36-60	Sandy loam, loamy sand, gravelly sand.	SM, SP-SM	A-1, A-2, A-3	0	80-100	70-95	35-55	5-25	<26	NP-6

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
WU*: Urban land.											

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

(The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated)

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	G/cc	In/hr	In/in	pH					Pct
At	0-16	1-6	1.00-1.40	6.0-20	0.04-0.08	3.6-5.0	Low	0.17	3	1	2-4
Atsion	16-22	2-7	1.40-1.60	2.0-20	0.04-0.15	3.6-5.0	Low	0.20			
	22-60	2-10	1.60-1.80	6.0-20	0.04-0.14	4.5-5.0	Low	0.20			
BoB	0-10	10-22	1.30-1.45	0.6-2.0	0.19-0.23	4.5-5.5	Low	0.43	3	---	2-4
Boonton	10-33	5-18	1.55-1.65	0.6-2.0	0.12-0.21	4.5-5.5	Low	0.37			
	33-60	5-15	1.65-1.80	<0.2	0.06-0.10	5.6-7.3	Low	0.20			
BoC	0-8	10-22	1.30-1.45	0.6-2.0	0.19-0.23	4.5-5.5	Low	0.43	3	---	2-4
Boonton	8-33	5-18	1.55-1.65	0.6-2.0	0.12-0.21	4.5-5.5	Low	0.37			
	33-60	5-15	1.65-1.80	<0.2	0.06-0.10	5.6-7.3	Low	0.20			
BoD	0-7	10-22	1.30-1.45	0.6-2.0	0.19-0.23	4.5-5.5	Low	0.43	3	---	2-4
Boonton	7-27	5-18	1.55-1.65	0.6-2.0	0.12-0.21	4.5-5.5	Low	0.37			
	27-60	5-15	1.65-1.80	<0.2	0.06-0.10	5.6-7.3	Low	0.20			
BUB*:											
Boonton	0-10	10-22	1.30-1.45	0.6-2.0	0.19-0.23	4.5-5.5	Low	0.43	3	---	2-4
	10-33	5-18	1.55-1.65	0.6-2.0	0.12-0.21	4.5-5.5	Low	0.37			
	33-60	5-15	1.65-1.80	<0.2	0.06-0.10	5.6-7.3	Low	0.20			
Urban land.											
ChA, ChB	0-6	12-25	1.20-1.40	0.6-2.0	0.18-0.22	5.1-7.3	Low	0.49	2	---	1-3
Chalfont	6-26	15-35	1.40-1.60	0.6-2.0	0.12-0.16	5.1-7.3	Low	0.49			
	26-50	15-35	1.60-1.80	0.06-0.2	0.08-0.12	5.1-7.3	Low	0.32			
	50-60	15-27	1.50-1.70	0.06-0.6	0.08-0.12	5.1-7.3	Low	0.32			
DnA, DnC	0-13	3-8	1.20-1.60	6.0-20.0	0.06-0.08	3.6-5.5	Low	0.20	4	2	.5-2
Downer	13-30	6-18	1.45-1.65	0.6-6.0	0.10-0.13	4.5-5.5	Low	0.28			
	30-60	3-25	1.40-1.75	>2.0	0.03-0.10	4.5-5.5	Low	0.17			
DoB	0-13	5-10	1.20-1.60	2.0-6.0	0.10-0.14	3.6-5.5	Low	0.28	4	3	1-3
Downer	13-30	6-18	1.45-1.65	0.6-6.0	0.10-0.13	4.5-5.5	Low	0.28			
	30-60	3-25	1.40-1.75	>2.0	0.03-0.10	4.5-5.5	Low	0.17			
DTB*:											
Downer	0-13	3-8	1.20-1.60	6.0-20.0	0.06-0.08	3.6-5.5	Low	0.20	4	2	.5-2
	13-30	6-18	1.45-1.65	0.6-6.0	0.10-0.13	4.5-5.5	Low	0.28			
	30-60	3-25	1.40-1.75	>2.0	0.03-0.10	4.5-5.5	Low	0.17			
Urban land.											
DTD*:											
Downer	0-10	3-8	1.20-1.60	6.0-20.0	0.06-0.08	3.6-5.5	Low	0.20	4	2	.5-2
	10-25	6-18	1.45-1.65	0.6-6.0	0.10-0.13	4.5-5.5	Low	0.28			
	25-60	3-25	1.40-1.75	>2.0	0.03-0.10	4.5-5.5	Low	0.17			
Urban land.											
DUA*:											
Dunellen	0-14	5-20	1.10-1.30	2.0-6.0	0.13-0.16	4.5-5.5	Low	0.24	3	---	2-4
	14-40	5-18	1.20-1.40	0.6-6.0	0.10-0.20	4.5-5.5	Low	0.32			
	40-60	5-15	1.30-1.50	>6.0	0.05-0.10	5.1-6.0	Low	0.24			

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	G/cc	In/hr	In/in	pH					Pct
DUA*:											
Urban land.											
DvA, DvB----------	0-11	10-18	1.10-1.30	2.0-6.0	0.13-0.16	4.5-5.5	Low----------	0.24	3	---	1-3
Dunellen Variant	11-25	10-18	1.20-1.40	0.6-6.0	0.10-0.20	4.5-5.5	Low----------	0.32			
	25-60	2-10	1.30-1.50	>6.0	0.05-0.10	5.1-6.0	Low----------	0.24			
DWA*:											
Dunellen Variant	0-11	10-18	1.10-1.30	2.0-6.0	0.13-0.16	4.5-5.5	Low----------	0.24	3	---	1-3
	11-25	10-18	1.20-1.40	0.6-6.0	0.10-0.20	4.5-5.5	Low----------	0.32			
	25-60	2-10	1.30-1.50	>6.0	0.05-0.10	5.1-6.0	Low----------	0.24			
Urban land.											
Ek----------	0-8	11-30	---	0.6-2.0	0.15-0.22	3.6-5.5	Low----------	0.43	3	---	1-3
Elkton	8-35	35-55	---	<0.2	0.14-0.19	3.6-5.5	Moderate-----	0.28			
	35-60	5-50	---	0.2-6.0	0.14-0.20	3.6-5.5	Moderate-----	0.28			
EoA, EoB----------	0-20	5-15	1.10-1.30	0.6-6.0	0.13-0.19	5.1-6.0	Low----------	0.24	3	---	2-4
Ellington Variant	20-36	5-18	1.20-1.40	0.6-6.0	0.13-0.19	5.1-6.0	Low----------	0.24			
	36-40	---	---	---	---	---	----------	----			
ESA*:											
Ellington Variant--------	0-20	5-15	1.10-1.30	0.6-6.0	0.13-0.19	5.1-6.0	Low----------	0.24	3	---	2-4
	20-36	5-18	1.20-1.40	0.6-6.0	0.13-0.19	5.1-6.0	Low----------	0.24			
	36-40	---	---	---	---	---	----------	----			
Urban land.											
EvB, EvC, EvD----	0-40	1-4	1.10-1.55	6.0-20	0.04-0.09	3.6-5.0	Low----------	0.17	5	2	<1
Evesboro	40-60	3-6	1.10-1.55	6.0-20	0.04-0.09	3.6-5.0	Low----------	0.17			
	30-72	1-5	1.10-1.60	6.0-20	0.04-0.10	4.5-5.0	Low----------	0.17			
Fa----------	0-16	8-20	1.20-1.45	0.6-6.0	0.15-0.24	3.6-5.5	Low----------	0.28	4	---	---
Fallsington	16-26	18-30	1.25-1.45	0.6-2.0	0.15-0.18	3.6-5.5	Low----------	0.43			
	26-60	10-25	1.25-1.40	.0-6.0	0.06-0.16	3.6-5.5	Low----------	0.43			
Fb----------	0-16	8-20	1.20-1.45	0.6-6.0	0.15-0.24	3.6-5.5	Low----------	0.28	4	---	---
Fallsington	16-27	18-30	1.25-1.45	0.6-2.0	0.15-0.18	3.6-5.5	Low----------	0.43			
	27-60	10-25	1.25-1.45	2.0-6.0	0.06-0.16	3.6-5.5	Low----------	0.43			
Fd----------	0-5	8-20	1.20-1.45	0.6-2.0	0.15-0.19	3.6-5.5	Low----------	0.28	4	5	2-5
Fallsington Variant	5-26	28-40	1.25-1.45	0.06-0.2	0.16-0.20	3.6-5.5	Moderate-----	0.43			
	26-30	20-35	1.30-1.55	0.6-2.0	0.12-0.15	3.6-5.5	Moderate-----	0.43			
	30-60	5-15	1.35-1.60	2.0-20	0.06-0.13	3.6-5.5	Low----------	0.43			
FrB----------	0-25	5-10	1.25-1.60	6.0-20	0.05-0.10	3.6-5.5	Low----------	0.20	4	2	1-2
Fort Mott	25-35	10-30	1.25-1.80	0.6-6.0	0.12-0.16	3.6-5.5	Low----------	0.32			
	35-60	5-15	1.30-1.80	6.0-20	0.05-0.10	3.6-5.5	Low----------	0.17			
HaA----------	0-8	10-25	1.20-1.40	0.6-2.0	0.18-0.22	5.1-6.0	Low----------	0.32	3	---	2-4
Haledon	8-24	10-20	1.30-1.50	0.6-2.0	0.14-0.19	5.1-6.0	Low----------	0.43			
	24-60	10-20	1.60-1.80	0.06-0.6	0.06-0.10	5.6-7.3	Low----------	0.24			
	60-64	10-20	1.30-1.50	0.06-0.6	0.06-0.10	5.6-7.3	Low----------	0.20			
HaB----------	0-8	10-25	1.20-1.40	0.6-2.0	0.18-0.22	5.1-6.0	Low----------	0.32	3	---	2-4
Haledon	8-24	10-20	1.30-1.50	0.6-2.0	0.14-0.19	5.1-6.0	Low----------	0.43			
	24-60	10-20	1.60-1.80	0.06-0.6	0.06-0.10	5.6-7.3	Low----------	0.24			
	60-70	10-20	1.30-1.50	0.06-0.6	0.06-0.10	5.6-7.3	Low----------	0.20			

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	G/cc	In/hr	In/in	pH					Pct
HBB*:											
Haledon	0-8	10-25	1.20-1.40	0.6-2.0	0.18-0.22	5.1-6.0	Low	0.32	3	---	2-4
	8-24	10-20	1.30-1.50	0.6-2.0	0.14-0.19	5.1-6.0	Low	0.43			
	24-60	10-20	1.60-1.80	0.06-0.6	0.06-0.10	5.6-7.3	Low	0.24			
	60-70	10-20	1.30-1.50	0.06-0.6	0.06-0.10	5.6-7.3	Low	0.20			
Urban land.											
HcA	0-7	20-28	1.35-1.45	0.6-2.0	0.16-0.20	5.1-6.0	Low	0.32	3	---	2-4
Haledon Variant	7-16	20-35	1.40-1.50	0.6-2.0	0.14-0.19	5.1-6.0	Low	0.37			
	16-22	20-35	1.70-1.80	0.6-2.0	0.14-0.19	5.1-6.0	Low	0.24			
	22-60	20-28	1.55-1.65	0.6-2.0	0.12-0.16	5.1-6.0	Low	0.32			
HeA	0-18	2-7	1.20-1.60	6.0-20.0	0.06-0.10	3.6-5.5	Low	0.20	4	2	1-3
Hammonton	18-30	10-18	1.45-1.65	2.0-6.0	0.10-0.16	4.5-5.5	Low	0.28			
	30-60	2-7	1.40-1.75	>2.0	0.03-0.15	4.5-5.5	Low	0.17			
HlA	0-18	2-7	1.20-1.60	6.0-20.0	0.06-0.10	3.6-5.5	Low	0.20	4	2	1-3
Hammonton	18-48	10-18	1.45-1.65	2.0-6.0	0.10-0.16	4.5-5.5	Low	0.28			
	48-60	35-60	1.35-1.50	<0.2	0.12-0.14	4.5-5.5	Moderate	0.37			
HmA	0-18	5-10	1.20-1.60	2.0-6.0	0.10-0.14	3.6-5.5	Low	0.28	4	3	2-4
Hammonton	18-30	10-18	1.45-1.65	2.0-6.0	0.10-0.16	4.5-5.5	Low	0.28			
	30-60	2-7	1.40-1.75	>2.0	0.03-0.15	4.5-5.5	Low	0.17			
HoA	0-10	10-15	1.25-1.40	0.6-6.0	0.10-0.20	3.6-5.5	Low	0.28	3	3	1-3
Holmdel	10-42	15-30	1.35-1.45	0.6-2.0	0.12-0.19	4.5-5.5	Low	0.32			
	42-60	2-15	1.50-1.65	>2.0	0.05-0.16	4.5-5.5	Low	0.17			
HU*.											
Humaquepts											
KeA, KeB, KeD	0-15	5-20	1.20-1.60	0.6-6.0	0.12-0.18	3.6-5.5	Low	0.37	3-2	3	1-3
Keyport	15-60	30-50	1.35-1.60	<0.2	0.13-0.17	4.5-5.5	Moderate	0.32			
KfA, KfB, KfC, KfD	0-8	10-25	1.20-1.60	0.2-2.0	0.16-0.22	3.6-5.5	Low	0.43	3-2	5	1-5
Keyport	8-60	30-50	1.35-1.60	<0.2	0.13-0.17	4.5-5.5	Moderate	0.32			
KGB*:											
Keyport	0-8	10-25	1.20-1.60	0.2-2.0	0.16-0.22	3.6-5.5	Low	0.43	3-2	5	1-5
	8-60	30-50	1.35-1.60	<0.2	0.13-0.17	4.5-5.5	Moderate	0.32			
Urban land.											
KlA	0-6	2-12	1.30-1.45	>6.0	0.06-0.11	3.6-5.0	Low	0.17	5	---	1-3
Klej	6-60	2-10	1.35-1.55	>6.0	0.06-0.08	3.6-5.0	Low	0.17			
	60-64	10-45	---	<2.0	0.11-0.17	3.6-5.0	Low	0.17			
KmA	0-6	1-4	1.45-1.60	6.0-20	0.06-0.11	3.6-5.0	Low	0.17	5	---	<1
Klej	6-48	2-5	1.55-1.65	6.0-20	0.06-0.08	3.6-5.0	Low	0.17			
	48-60	40-60	1.60-1.70	0.06-0.6	0.16-0.20	3.6-5.0	High	0.43			
KUA*:											
Klej	0-6	1-4	1.45-1.60	6.0-20	0.06-0.11	3.6-5.0	Low	0.17	5	---	<1
	6-48	2-5	1.55-1.65	6.0-20	0.06-0.08	3.6-5.0	Low	0.17			
	48-60	40-60	1.60-1.70	0.06-0.6	0.16-0.20	3.6-5.0	High	0.43			
Urban land.											

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	G/cc	In/hr	In/in	pH					Pct
KvB, KvD, KvE----	0-8	10-25	1.20-1.40	2.0-6.0	0.08-0.12	4.5-6.0	Low----------	0.20	2	---	.5-2
Klinesville	8-12	10-20	1.40-1.60	2.0-6.0	0.06-0.10	4.5-6.0	Low----------	0.20			
	12-16	---	---	---	---	---	----------	----			
KWB*:											
Klinesville-----	0-8	10-25	1.20-1.40	2.0-6.0	0.08-0.12	4.5-6.0	Low----------	0.20	2	---	.5-2
	8-12	10-20	1.40-1.60	2.0-6.0	0.06-0.10	4.5-6.0	Low----------	0.20			
	12-16	---	---	---	---	---	----------	----			
Urban land.											
LaA----------	0-21	1-4	1.10-1.65	6.0-20	0.04-0.09	3.6-5.0	Low----------	0.17	5	1	---
Lakehurst	21-60	1-10	1.45-1.65	6.0-20	0.04-0.10	3.6-5.0	Low----------	0.17			
LeB----------	0-20	1-4	1.25-1.50	6.0-20	0.04-0.09	3.6-5.0	Low----------	0.10	5	1	1-2
Lakewood	20-60	1-10	1.10-1.60	6.0-20	0.04-0.10	3.6-5.0	Low----------	0.17			
	60-64	2-4	1.50-1.65	0.6-20	0.04-0.10	3.6-5.0	Low----------	0.10			
LnA, LnB---------	0-7	10-30	1.25-1.55	0.6-2.0	0.22-0.26	5.1-5.5	Low----------	0.43	3	---	1-3
Lansdowne	7-50	35-60	1.30-1.70	0.06-0.2	0.16-0.20	5.1-6.0	Moderate-----	0.43			
	50-60	10-35	1.30-1.75	0.6-2.0	0.14-0.18	5.1-6.0	Low----------	0.28			
	60-64	---	---	---	---	---	----------	----			
LUA*:											
Lansdowne-------	0-7	10-30	1.25-1.55	0.6-2.0	0.22-0.26	5.1-5.5	Low----------	0.43	3	---	1-3
	7-50	35-60	1.30-1.70	0.06-0.2	0.16-0.20	5.1-6.0	Moderate-----	0.43			
	50-60	10-35	1.30-1.75	0.6-2.0	0.14-0.18	5.1-6.0	Low----------	0.28			
	60-64	---	---	---	---	---	----------	----			
Urban land.											
LvA----------	0-9	20-28	1.30-1.55	0.6-2.0	0.22-0.26	5.1-5.5	Low----------	0.43	3	---	1-2
Lansdowne	9-21	35-55	1.55-1.80	0.06-0.2	0.16-0.20	5.1-5.5	Moderate-----	0.43			
Variant	21-25	20-28	1.60-1.85	0.6-2.0	0.14-0.18	5.1-5.5	Low----------	0.43			
	25-29	---	---	---	---	---	----------	----			
Ma----------	0-30	---	0.30-0.65	6.0-20	0.30-0.35	3.6-5.5	----------	0.17	---	---	20-95
Manahawkin	30-60	0-10	1.10-1.70	2.0-20	0.04-0.08	4.5-5.0	Low----------	0.17			
MeA, MeB---------	0-13	7-16	1.20-1.45	0.6-2.0	0.16-0.24	4.5-5.5	Low----------	0.37	4	---	2-4
Matapeake	13-31	18-30	1.25-1.50	0.2-2.0	0.18-0.24	3.6-5.5	Low----------	0.43			
	31-60	8-15	1.30-1.60	0.6-6.0	0.08-0.18	3.6-5.5	Low----------	0.28			
MgA, MgB---------	0-10	7-16	1.20-1.45	0.6-2.0	0.14-0.22	4.5-5.5	Low----------	0.37	4	---	.5-6
Mattapex	10-40	18-30	1.25-1.50	0.2-2.0	0.18-0.22	3.6-5.5	Low----------	0.43			
	40-60	8-15	1.30-1.60	0.6-6.0	0.14-0.18	3.6-5.5	Low----------	0.28			
MoA, MoB---------	0-6	10-20	1.20-1.30	0.6-2.0	0.18-0.22	5.1-6.5	Low----------	0.32	4	---	1-2
Mount Lucas	6-30	17-32	1.30-1.60	0.06-0.6	0.12-0.16	5.1-7.3	Low----------	0.28			
	30-60	5-20	1.30-1.70	0.06-6.0	0.04-0.12	5.6-7.3	Low----------	0.28			
MsB----------	0-6	10-20	1.20-1.30	0.6-2.0	0.16-0.22	5.1-6.5	Low----------	0.28	3	---	---
Mount Lucas	6-30	17-32	1.30-1.60	0.06-0.6	0.12-0.16	5.1-7.3	Low----------	0.28			
	30-60	5-32	1.30-1.70	0.06-6.0	0.04-0.12	5.6-7.3	Low----------	0.28			
Mu----------	0-7	5-20	0.75-1.50	0.6-2.0	0.10-0.20	3.6-5.0	Low----------	0.28	3	---	2-7
Mullica	7-28	10-25	1.25-1.60	0.6-2.0	0.10-0.13	3.6-5.0	Low----------	0.24			
	28-60	5-25	1.30-1.65	0.6-20	0.02-0.10	3.6-5.0	Low----------	0.28			

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	G/cc	In/hr	In/in	pH					Pct
NaA, NaB----------	0-11	10-25	1.20-1.55	0.6-2.0	0.12-0.20	3.6-5.5	Low----------	0.28	4	---	2-4
Nixon	11-40	18-25	1.35-1.60	0.6-2.0	0.10-0.14	3.6-5.5	Low----------	0.43			
	40-60	5-15	1.40-1.70	2.0-6.0	0.05-0.10	3.6-5.5	Low----------	0.17			
NCB*:											
Nixon----------	0-11	10-25	1.20-1.55	0.6-2.0	0.12-0.20	3.6-5.5	Low----------	0.28	4	---	2-4
	11-40	18-25	1.35-1.60	0.6-2.0	0.10-0.14	3.6-5.5	Low----------	0.43			
	40-60	5-15	1.40-1.70	2.0-6.0	0.05-0.10	3.6-5.5	Low----------	0.17			
Urban land.											
NfA, NfB----------	0-16	10-20	1.20-1.40	0.6-2.0	0.12-0.20	3.6-5.5	Low----------	0.28	4	---	2-4
Nixon Variant	16-38	18-25	1.25-1.45	0.6-2.0	0.10-0.14	3.6-5.5	Low----------	0.43			
	38-60	5-15	1.30-1.60	2.0-6.0	0.05-0.10	3.6-5.5	Low----------	0.17			
NGA*:											
Nixon Variant---	0-16	10-20	1.20-1.40	0.6-2.0	0.12-0.20	3.6-5.5	Low----------	0.28	4	---	2-4
	16-38	18-25	1.25-1.45	0.6-2.0	0.10-0.14	3.6-5.5	Low----------	0.43			
	38-60	5-15	1.30-1.60	2.0-6.0	0.05-0.10	3.6-5.5	Low----------	0.17			
Urban land.											
Pa----------	0-8	20-30	1.28-1.44	0.6-2.0	0.18-0.22	5.1-6.0	Low----------	0.43	4	---	1-3
Parsippany	8-46	35-45	1.35-1.55	0.06-0.2	0.14-0.18	5.1-6.5	Moderate-----	0.43			
	46-60	5-45	1.30-1.55	0.2-6.0	0.14-0.18	6.1-7.3	Moderate-----	0.43			
Pb----------	0-4	20-30	1.28-1.44	0.6-2.0	0.18-0.22	5.1-6.0	Low----------	0.43	4	---	1-3
Parsippany	4-48	35-45	1.35-1.55	0.06-0.2	0.14-0.18	5.1-6.5	Moderate-----	0.43			
	48-60	5-45	1.30-1.55	0.2-6.0	0.14-0.18	6.1-7.3	Moderate-----	0.43			
Pc----------	0-3	15-25	1.20-1.45	0.6-2.0	0.18-0.22	5.1-6.0	Low----------	0.43	2	---	.5-4
Parsippany	3-23	35-70	1.25-1.50	0.06-0.2	0.14-0.18	5.1-6.5	Moderate-----	0.43			
Variant	23-60	5-15	1.30-1.60	0.6-6.0	0.02-0.16	6.1-7.3	Low----------	0.43			
PeA----------	0-28	3-10	1.30-1.50	2.0-6.0	0.04-0.10	3.6-5.0	Low----------	0.20	4	1	1-2
Pemberton	28-45	8-35	1.40-1.50	2.0-6.0	0.14-0.18	3.6-5.0	Low----------	0.28			
	45-60	2-45	1.25-1.60	0.6-6.0	0.06-0.16	3.6-5.0	Low----------	0.20			
PfA, PfB----------	0-8	10-20	1.20-1.40	0.6-6.0	0.16-0.20	3.6-5.5	Low----------	0.32	3	---	1-3
Penn	8-20	18-32	1.40-1.60	0.6-6.0	0.14-0.18	3.6-6.0	Low----------	0.24			
	20-32	18-25	1.40-1.60	0.6-6.0	0.04-0.08	5.1-6.5	Low----------	0.24			
	32-36	---	---	---	---	---	----------	----			
PhD----------	0-7	2-10	1.20-1.35	>6.0	0.03-0.08	3.6-5.0	Low----------	0.20	4	1	.5-2
Phalanx	7-30	2-25	1.60-1.95	0.6-20.0	0.02-0.10	4.5-5.5	Low----------	0.20			
	30-60	1-9	1.60-1.85	>6.0	0.02-0.08	4.5-5.5	Low----------	0.20			
PL*, PM*. Pits											
PN*, PO*, PW*. Psamments											
ReA, ReB----------	0-10	15-22	1.20-1.40	0.6-2.0	0.16-0.20	5.1-6.5	Low----------	0.43	2-1	---	1-4
Reaville	10-22	18-32	1.30-1.60	0.06-0.2	0.08-0.14	5.1-6.5	Low----------	0.28			
	22-28	15-24	1.30-1.70	0.06-0.2	0.06-0.12	5.1-6.5	Low----------	0.28			
	28-32	---	---	---	---	---	----------	----			

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	G/cc	In/hr	In/in	pH					Pct
RFA*:											
Reaville--------	0-10	15-22	1.20-1.40	0.6-2.0	0.16-0.20	5.1-6.5	Low----------	0.43	2-1	---	1-4
	10-22	18-32	1.30-1.60	0.06-0.2	0.08-0.14	5.1-6.5	Low----------	0.28			
	22-28	15-24	1.30-1.70	0.06-0.2	0.06-0.12	5.1-6.5	Low----------	0.28			
	28-32	---	---	---	---	---	----------	----			
Urban land.											
Rh----------	0-8	15-25	1.30-1.55	0.6-2.0	0.22-0.26	5.1-6.0	Low----------	0.43	3	---	1-2
Reaville Variant	8-25	28-35	1.55-1.80	0.2-2.0	0.16-0.20	5.1-6.0	Moderate-----	0.37			
	25-30	20-30	1.45-1.70	0.6-2.0	0.14-0.18	5.1-6.0	Low----------	0.37			
	30-34	---	---	---	---	---	----------	----			
Ro----------	0-7	10-20	1.10-1.30	0.2-2.0	0.14-0.18	4.5-6.0	Low----------	0.43	4	---	2-4
Rowland	7-40	15-32	1.20-1.50	0.2-2.0	0.14-0.18	4.5-6.0	Low----------	0.28			
	40-50	15-32	1.20-1.50	0.2-2.0	0.12-0.16	4.5-6.0	Low----------	0.28			
	50-60	3-12	1.40-1.70	2.0-6.0	0.03-0.08	4.5-6.0	Low----------	0.17			
SaA, SaB, SaC----	0-17	10-15	1.20-1.50	0.6-6.0	0.12-0.20	3.6-5.5	Low----------	0.28	4	---	2-4
Sassafras	17-37	18-25	1.30-1.60	0.6-2.0	0.11-0.22	3.6-5.5	Low----------	0.37			
	37-60	5-15	1.30-1.60	0.6-20	0.04-0.12	3.6-5.5	Low----------	0.17			
SgB, SgC, SgD----	0-17	10-15	1.20-1.50	0.6-6.0	0.10-0.12	3.6-5.5	Low----------	0.24	4	---	2-4
Sassafras	17-37	18-25	1.30-1.60	0.6-2.0	0.11-0.22	3.6-5.5	Low----------	0.37			
	37-60	5-15	1.30-1.60	0.6-20	0.04-0.12	3.6-5.5	Low----------	0.17			
SlA, SlB---------	0-12	10-20	1.20-1.50	0.6-6.0	0.12-0.20	3.6-5.5	Low----------	0.28	4	---	2-4
Sassafras	12-30	18-25	1.30-1.60	0.6-2.0	0.11-0.22	3.6-5.5	Low----------	0.37			
	30-60	5-15	1.30-1.60	0.6-20	0.04-0.12	3.6-5.5	Low----------	0.17			
SMB*:											
Sassafras-------	0-17	10-15	1.20-1.50	0.6-6.0	0.12-0.20	3.6-5.5	Low----------	0.28	4	---	---
	17-37	18-25	1.30-1.60	0.6-2.0	0.11-0.22	3.6-5.5	Low----------	0.37			
	37-60	5-15	1.30-1.60	0.6-20	0.04-0.12	3.6-5.5	Low----------	0.17			
Urban land.											
SrA----------	0-19	5-20	1.20-1.70	0.6-6.0	0.16-0.20	3.6-5.5	Low----------	0.32	5	3	3-5
Shrewsbury	19-36	15-35	1.20-1.70	0.2-2.0	0.13-0.17	3.6-5.5	Moderate-----	0.28			
	36-60	5-15	1.40-1.70	2.0-20	0.07-0.15	3.6-5.5	Low----------	0.20			
SU*:											
Sulfaquents.											
Sulfihemists.											
TnB----------	0-34	1-7	0.90-1.65	0.6-6.0	0.04-0.10	3.6-5.5	Low----------	0.20	4	1	.5-1
Tinton	34-48	5-30	1.20-1.65	2.0-6.0	0.14-0.18	3.6-5.5	Low----------	0.28			
	48-60	2-15	1.35-1.65	0.6-6.0	0.06-0.12	3.6-5.5	Low----------	0.20			
UB*, UC*, UD*.											
Udorthents											
UL*.											
Urban land											
Wa----------	0-8	20-30	1.20-1.30	0.2-2.0	0.14-0.28	4.5-6.5	Low----------	0.43	3	---	---
Watchung	8-27	35-45	1.25-1.55	<0.2	0.10-0.24	5.1-7.3	Moderate-----	0.37			
	27-60	25-45	1.30-1.65	0.2-2.0	0.12-0.24	5.6-7.3	Moderate-----	0.37			

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	G/cc	In/hr	In/in	pH					Pct
WdA, WdB--------- Woodstown	0-12 12-36 36-60	10-15 18-25 5-20	1.20-1.50 1.30-1.60 1.30-1.60	0.6-6.0 0.6-2.0 0.6-6.0	0.08-0.21 0.10-0.21 0.06-0.16	3.6-5.5 3.6-5.5 3.6-5.5	Low---------- Low---------- Low----------	0.28 0.37 0.28	4	---	---
WkA, WkB--------- Woodstown	0-12 12-36 36-45 45-60	10-15 10-22 2-8 20-40	1.20-1.50 1.30-1.60 1.30-1.60 1.50-1.70	0.6-2.0 0.6-2.0 0.6-2.0 <0.2	0.10-0.13 0.12-0.16 0.07-0.10 0.14-0.17	3.6-5.5 3.6-5.5 3.6-5.5 3.6-5.5	Low---------- Low---------- Low---------- Moderate-----	0.28 0.37 0.28 0.37	4	---	.5-2
W1A, W1B--------- Woodstown	0-12 12-36 36-60	10-20 18-25 5-20	1.25-1.50 1.30-1.60 1.30-1.60	0.6-6.0 0.6-2.0 0.6-6.0	0.08-0.21 0.10-0.21 0.06-0.16	3.6-5.5 3.6-5.5 3.6-5.5	Low---------- Low---------- Low----------	0.28 0.37 0.28	4	---	---
WU*: Woodstown------- Urban land.	0-12 12-36 36-60	10-15 18-25 5-20	1.20-1.50 1.30-1.60 1.30-1.60	0.6-6.0 0.6-2.0 0.6-6.0	0.08-0.21 0.10-0.21 0.06-0.16	3.6-5.5 3.6-5.5 3.6-5.5	Low---------- Low---------- Low----------	0.28 0.37 0.28	4	---	---

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--SOIL AND WATER FEATURES

("Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	
					Ft			In		
At---------- Atsion	C/D	None--------	---	---	0-1.0	Apparent	Nov-Jun	>60	---	Moderate.
BoB, BoC, BoD----- Boonton	C	None--------	---	---	1.5-6.0	Perched	Nov-May	>60	---	Moderate.
BUB*: Boonton----------	C	None--------	---	---	1.5-6.0	Perched	Nov-May	>60	---	Moderate.
Urban land.										
ChA, ChB---------- Chalfont	C	None--------	---	---	0.5-1.5	Perched	Nov-Mar	>40	Soft	High.
DnA, DnC, DoB----- Downer	B	None--------	---	---	>6.0	---	---	>60	---	Low.
DTB*, DTD*: Downer----------	B	None--------	---	---	>6.0	---	---	>60	---	Low.
Urban land.										
DUA*: Dunellen---------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate.
Urban land.										
DvA, DvB---------- Dunellen Variant	B	None--------	---	---	1.0-4.0	Apparent	Dec-Apr	>60	---	Moderate.
DWA*: Dunellen Variant-	B	None--------	---	---	1.0-4.0	Apparent	Dec-Apr	>60	---	Moderate.
Urban land.										
Ek---------- Elkton	C/D	Rare--------	---	---	0-1.0	Apparent	Jan-Apr	>60	---	High.
EoA, EoB---------- Ellington Variant	B	None--------	---	---	1.0-3.0	Apparent	Nov-Apr	20-40	Soft	High.
ESA*: Ellington Variant	B	None--------	---	---	1.0-3.0	Apparent	Nov-Apr	20-40	Soft	High.
Urban land.										
EvB, EvC, EvD----- Evesboro	A	None--------	---	---	>6.0	---	---	>60	---	Low.
Fa, Fb---------- Fallsington	B/D	None--------	---	---	0-1.0	Apparent	Dec-May	>60	---	High.
Fd---------- Fallsington Variant	D	Rare--------	---	---	0-1.0	Perched	Dec-May	>60	---	High.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	
					Ft			In		
FrB---------- Fort Mott	A	None--------	---	---	>6.0	---	---	>60	---	Moderate.
HaA, HaB---------- Haledon	C	None--------	---	---	0.5-1.5	Perched	Dec-May	>60	---	High.
HBB*: Haledon----------	C	None--------	---	---	0.5-1.5	Perched	Dec-May	>60	---	High.
Urban land.										
HcA---------- Haledon Variant	C	None--------	---	---	0-1.0	Perched	Nov-Jun	>60	---	High.
HeA---------- Hammonton	B	None--------	---	---	1.5-3.0	Apparent	Jan-Apr	>60	---	High.
HlA---------- Hammonton	B	None--------	---	---	1.5-4.0	Perched	Dec-May	>60	---	High.
HmA---------- Hammonton	B	None--------	---	---	1.5-3.0	Apparent	Jan-Apr	>60	---	High.
HoA---------- Holmdel	C	None--------	---	---	0.5-4.0	Apparent	Dec-May	>60	---	High.
HU*. Humaquepts										
KeA, KeB, KeD, KfA, KfB, KfC, KfD---------- Keyport	C	None--------	---	---	1.5-4.0	Perched	Nov-May	>60	---	High.
KGB*: Keyport----------	C	None--------	---	---	1.5-4.0	Perched	Nov-May	>60	---	High.
Urban land.										
KlA---------- Klej	B	None--------	---	---	1.5-2.0	Apparent	Dec-Apr	>60	---	Moderate.
KmA---------- Klej	B	None--------	---	---	1.5-2.0	Perched	Dec-Apr	>60	---	Moderate.
KUA*: Klej----------	B	None--------	---	---	1.5-2.0	Perched	Dec-Apr	>60	---	Moderate.
Urban land.										
KvB, KvD, KvE----- Klinesville	C/D	None--------	---	---	>6.0	---	---	10-20	Soft	Moderate.
KWB*: Klinesville------	C/D	None--------	---	---	>6.0	---	---	10-20	Soft	Moderate.
Urban land.										
LaA---------- Lakehurst	A	None--------	---	---	1.5-3.5	Apparent	Jan-Apr	>60	---	Low.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	
					Ft			In		
LeB---------- Lakewood	A	None--------	---	---	>6.0	---	---	>60	---	Low.
LnA, LnB---------- Lansdowne	C	None--------	---	---	1.0-2.5	Perched	Oct-Jun	>42	Soft	High.
LUA*: Lansdowne--------	C	None--------	---	---	1.0-2.5	Perched	Oct-Jun	>42	Soft	High.
Urban land.										
LvA---------- Lansdowne Variant	C	None--------	---	---	1.0-2.5	Perched	Oct-Jun	20-40	Soft	High.
Ma---------- Manahawkin	D	Frequent----	Long------	Jan-Mar	+1-0	Apparent	Oct-Jul	>60	---	High.
MeA, MeB---------- Matapeake	B	None--------	---	---	>6.0	---	---	>60	---	Moderate.
MgA, MgB---------- Mattapex	C	None--------	---	---	1.5-2.5	Apparent	Jan-Apr	>60	---	High.
MoA, MoB, MsB----- Mount Lucas	C	None--------	---	---	0.5-3.0	Perched	Nov-Mar	>48	Hard	High.
Mu---------- Mullica	C	Rare--------	---	---	0-0.5	Apparent	Dec-May	>60	---	High.
NaA, NaB---------- Nixon	B	None--------	---	---	>6.0	---	---	>60	---	Moderate.
NCB*: Nixon----------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate.
Urban land.										
NfA, NfB---------- Nixon Variant	B	None--------	---	---	1.0-4.0	Apparent	Dec-May	>60	---	High.
NGA*: Nixon Variant----	B	None--------	---	---	1.0-4.0	Apparent	Dec-May	>60	---	High.
Urban land.										
Pa---------- Parsippany	C/D	None--------	---	---	0-1.0	Apparent	Oct-May	>60	---	High.
Pb---------- Parsippany	C/D	Frequent----	Brief-----	Dec-May	0-1.0	Apparent	Oct-May	>60	---	High.
Pc---------- Parsippany Variant	D	Rare--------	---	---	0-1.0	Apparent	Oct-May	>60	---	High.
PeA---------- Pemberton	B	None--------	---	---	1.0-4.0	Apparent	Dec-May	>60	---	Moderate.
PfA, PfB---------- Penn	C	None--------	---	---	>6.0	---	---	20-40	Soft	Moderate.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	
					Ft			In		
PhD---------- Phalanx	B	None--------	---	---	>6.0	---	---	>60	---	Low.
PL*, PM*. Pits										
PN*, PO*, PW*. Psamments										
ReA, ReB---------- Reaville	C	None--------	---	---	0.5-3.0	Apparent	Nov-Mar	20-40	Soft	High.
RFA*: Reaville---------	C	None--------	---	---	0.5-3.0	Apparent	Nov-Mar	20-40	Soft	High.
Urban land.										
Rh---------- Reaville Variant	D	None--------	---	---	0-0.5	Apparent	Sep-May	20-40	Soft	High.
Ro---------- Rowland	C	Occasional	Brief-----	Nov-Mar	1.0-3.0	Apparent	Nov-May	>60	---	High.
SaA, SaB, SaC, SgB, SgC, SgD, SlA, SlB--------- Sassafras	B	None--------	---	---	>6.0	---	---	>60	---	Moderate.
SMB*: Sassafras--------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate.
Urban land.										
SrA---------- Shrewsbury	C/D	None--------	---	---	0-1.0	Apparent	Oct-Jun	>60	---	High.
SU*: Sulfaquents.										
Sulfihemists.										
TnB---------- Tinton	A	None--------	---	---	>6.0	---	---	>60	---	Moderate.
UB*, UC*, UD*. Udorthents										
UL*. Urban land										
Wa---------- Watchung	D	None--------	---	---	0-1.0	Apparent	Dec-Jun	>60	---	High.
WdA, WdB---------- Woodstown	C	None--------	---	---	1.5-2.5	Apparent	Feb-Apr	>60	---	High.
WkA, WkB---------- Woodstown	C	None--------	---	---	1.5-3.0	Apparent	Feb-Apr	>60	---	High.
WlA, WlB---------- Woodstown	C	None--------	---	---	1.5-2.5	Apparent	Feb-Apr	>60	---	High.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	
					Ft			In		
WU*:										
Woodstown	C	None	---	---	1.5-2.5	Apparent	Feb-Apr	>60	---	High.
Urban land.										

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Atsion	Sandy, siliceous, mesic Aeric Haplaquods
Boonton	Coarse-loamy, mixed, mesic Typic Fragiudalfs
Chalfont	Fine-silty, mixed, mesic Aquic Fragiudalfs
Downer	Coarse-loamy, siliceous, mesic Typic Hapludults
Dunellen	Coarse-loamy, mixed, mesic Typic Hapludults
Dunellen Variant	Coarse loamy, mixed, mesic Aquic Hapludults
Elkton	Clayey, mixed, mesic Typic Ochraquults
Ellington Variant	Coarse-loamy, mixed, mesic Aquic Hapludults
Evesboro	Mesic, coated Typic Quartzipsamments
Fallsington	Fine-loamy, siliceous, mesic Typic Ochraquults
Fallsington Variant	Fine-loamy, siliceous, mesic Typic Ochraquults
Fort Mott	Loamy, siliceous, mesic Arenic Hapludults
Haledon	Coarse-loamy, mixed, mesic Aquic Fragiudalfs
Haledon Variant	Fine-loamy, mixed, mesic, Aeric Fragiaqualfs
Hammonton	Coarse-loamy, siliceous, mesic Aquic Hapludults
Holmdel	Fine-loamy, mixed, mesic Aquic Hapludults
Humaquepts	Humaquepts
Keyport	Clayey, mixed, mesic Aquic Hapludults
Klej	Mesic, coated Aquic Quartzipsamments
Klej clayey substratum	Mesic, coated Aquic Quartzipsamments
Klinesville	Loamy-skeletal, mixed, mesic Lithic Dystrochrepts
Lakehurst	Mesic, coated Haplaquodic Quartzipsamments
Lakewood	Mesic, coated Spodic Quartzipsamments
Lansdowne	Fine, mixed, mesic Aquultic Hapludalfs
Lansdowne Variant	Fine, mixed, mesic Aquults Hapludalfs
Manahawkin	Sandy or sandy-skeletal, siliceous, dysic, mesic Terric Medisaprists
Matapeake	Fine-loamy, mixed, mesic Typic Hapludults
Mattapex	Fine-loamy, mixed, mesic Aquic Hapludults
Mount Lucas	Fine-loamy, mixed, mesic Aquic Hapludalfs
Mullica	Coarse-loamy, siliceous, acid, mesic Typic Humaquepts
Nixon	Fine-loamy, mixed, mesic Typic Hapludults
Nixon Variant	Fine-loamy, siliceous, mesic Aquic Hapludults
Parsippany	Fine, mixed, mesic Aeric Ochraqualfs
Parsippany Variant	Clayey over sandy or sandy skeletal, mixed, mesic Aeric Ochraqualfs
Pemberton	Loamy, mixed, mesic Arenic Hapludults
Penn	Fine-loamy, mixed, mesic Ultic Hapludalfs
Phalanx	Coarse-loamy, siliceous, mesic Typic Hapludults
Psamments	Psamments
Reaville	Fine-loamy, mixed, mesic Aquic Hapludalfs
Reaville Variant	Fine-loamy, mixed, mesic Aeric Ochraqualfs
Rowland	Fine-loamy, mixed, mesic Fluvaquentic Dystrochrepts
Sassafras	Fine-loamy, siliceous, mesic Typic Hapludults
Shrewsbury	Fine-loamy, mixed, mesic Typic Ochraquults
Tinton	Loamy, mixed, mesic Arenic Hapludults
Udorthents	Udorthents
Watchung	Fine, mixed, mesic Typic Ochraqualfs
Woodstown	Fine-loamy, siliceous, mesic Aquic Hapludults

TABLE 18. RELATIONSHIP BETWEEN SOIL SERIES AND PARENT MATERIAL, TEXTURE OF THE SUBSOIL, AND DRAI

Parent material, texture of subsoil and other soil characteristics	DRAINAGE				
	Excessively drained	Well drained	Moderately well drained	Somewhat poorly drained	Poo dra
GLACIAL TILL					
Deep soils derived mostly from red shale and basalt.					
Moderately fine textured or medium textured subsoil		Boonton	Boonton	Haledon	Haledo Varia
GLACIAL OUTWASH DEPOSITS					
Deep soils derived mostly from red shale, basalt, sandstone, and granite gneiss.					
Moderately coarse textured subsoil		Dunellen	Dunellen Variant		
Moderately deep soils derived from red shale, basalt, sandstone, and granite gneiss					
Moderately coarse textured subsoil		Ellington Variant			
LACUSTRINE DEPOSITS					
Deep soils formed in stratified silty and clayey sediments.					
Fine textured subsoil					Parsipa
RESIDUAL MATERIALS					
Deep soil weathered from diabase bedrock.					
Moderately fine textured or fine textured subsoil			Mount Lucas		Watchu
Deep soils weathered from metamorphosed shale and argillite.					
Moderately fine textured subsoil				Chalfont	
Shallow soils weathered mostly from red shale.					
Medium textured subsoil		Klinesville			
Moderately deep soils weathered mostly from red shale.					
Medium textured subsoil		Penn	Reaville		Reavil Varia
Fine textured subsoil			Lansdowne Variant	Lansdowne Variant	
Deep soils weathered from red shale.					
Fine textured subsoil			Lansdowne	Lansdowne	
COASTAL PLAIN MATERIAL					

TABLE 18. RELATIONSHIP BETWEEN SOIL SERIES AND PARENT MATERIAL, TEXTURE OF THE SUBSOIL, AND DRAINAGE-

Parent material, texture of subsoil and other soil characteristics	DRAINAGE				
	Excessively drained	Well drained	Moderately well drained	Somewhat poorly drained	P dr
Deep soils without albic horizons formed in sandy acid marine sediments.					
Coarse textured subsoil	Evesboro		Klej	Klej	
Moderately coarse textured subsoil					
Subsoil with ironstone		Phalanx			
Subsoil without ironstone		Downer	Hammonton	Hammonton	
Moderately coarse, medium, or moderately fine textured subsoil.					
Sandy surface layer more than 20 inches thick		Fort Mott			
Sandy surface layer less than 20 inches thick.					
Yellowish brown or brown subsoil		Sassafras	Woodstown		Falls
Yellowish red or red subsoil		Nixon	Nixon Variant		Falls Vari
Moderately coarse textured subsoil and glauconite.					
Sandy layer more than 20 inches thick over fine loamy subsoil		Tinton	Pemberton	Pemberton	
Sandy layer less than 20 inches thick over loamy material			Holmdel		
Medium textured or moderately fine textured subsoil		Matapeake	Mattapex		
Moderately fine textured subsoil			Keyport		Elkto
RECENT ALLUVIAL DEPOSITS					
Medium textured subsoil			Rowland	Rowland	
VARIABLE MATERIAL					
Medium or moderately coarse textured material		Udorthents	Udorthents	Udorthents	
Coarse textured material		Psamments	Psamments		
Coarse textured material in tidal areas					Sulfa
ORGANIC MATERIAL					
Organic material 10 to 50 inches over mineral material					
Organic material 10 to 50 inches over mineral material in tidal areas					

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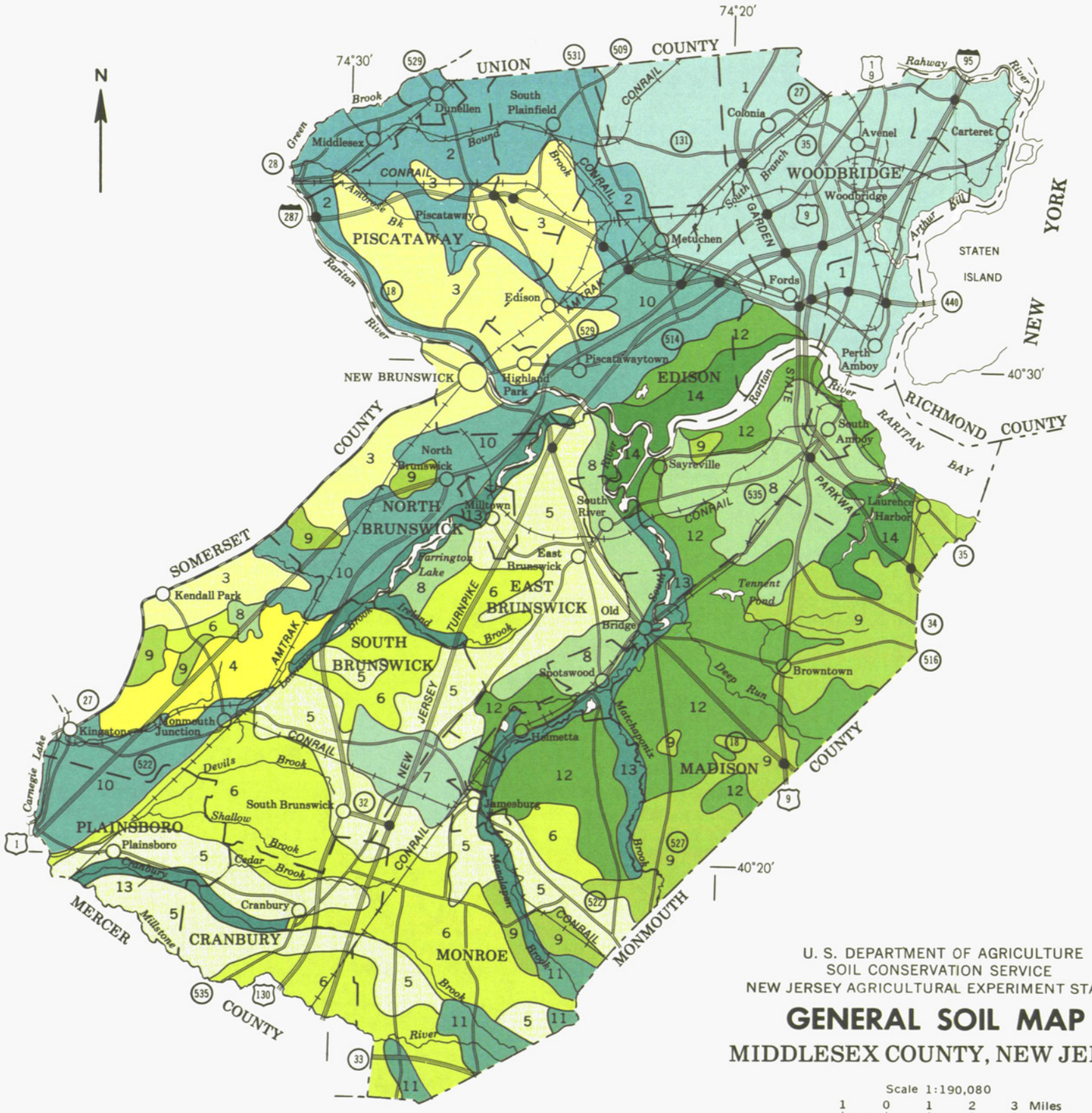


U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
NEW JERSEY AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP

MIDDLESEX COUNTY, NEW JERSEY

Scale 1:190,080

1 0 1 2 3 Miles

1 0 3 6 Km

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

LEGEND

SOILS THAT FORMED IN GLACIAL TILL OR GLACIAL OUTWASH

1 — Urban land-Boonton-Haledon: Urban land and nearly level to strongly sloping, deep, well drained to somewhat poorly drained soils that have a firm or very firm, loamy subsoil; on uplands

2 — Urban land-Dunellen Variant-Ellington Variant-Dunellen: Urban land and nearly level to gently sloping, deep, well drained and moderately well drained soils that have a loamy subsoil

SOILS THAT FORMED IN MATERIAL THAT WEATHERED FROM SHALE OR DIABASE

3 — Klinesville-Urban land-Reaville-Lansdowne: Nearly level to steep, shallow to deep, well drained and moderately well drained soils that have a loamy subsoil containing shale fragments; Urban land; on uplands

4 — Mount Lucas-Watchung-Chalfont: Nearly level to gently sloping, deep, moderately well drained to poorly drained soils that have a loamy subsoil containing fragments of diabase or shale; on uplands

SOILS THAT FORMED IN COASTAL PLAIN MATERIALS

5 — Sassafras-Woodston: Nearly level to strongly sloping, deep, well drained and moderately well drained soils with a loamy subsoil and sandy substratum; on uplands

6 — Woodston-Fallsington-Sassafras: Nearly level to strongly sloping, deep, moderately well drained, poorly drained, and well drained soils with a loamy subsoil and sandy substratum; on uplands

7 — Matapeake-Mattapex: Nearly level to gently sloping, deep, well drained and moderately well drained soils with a loamy subsoil and substratum; on uplands

8 — Downer-Urban land-Hammonton: Nearly level to moderately sloping, deep, well drained and moderately well drained soils with a loamy subsoil and sandy substratum; Urban land; on uplands

9 — Keyport-Elkton: Nearly level to strongly sloping, deep, moderately well drained and poorly drained soils with a loamy subsoil and substratum; on uplands

10 — Urban land-Nixon-Nixon Variant: Urban land and nearly level to gently sloping, deep, well drained and moderately well drained soils with a loamy subsoil and substratum; on uplands

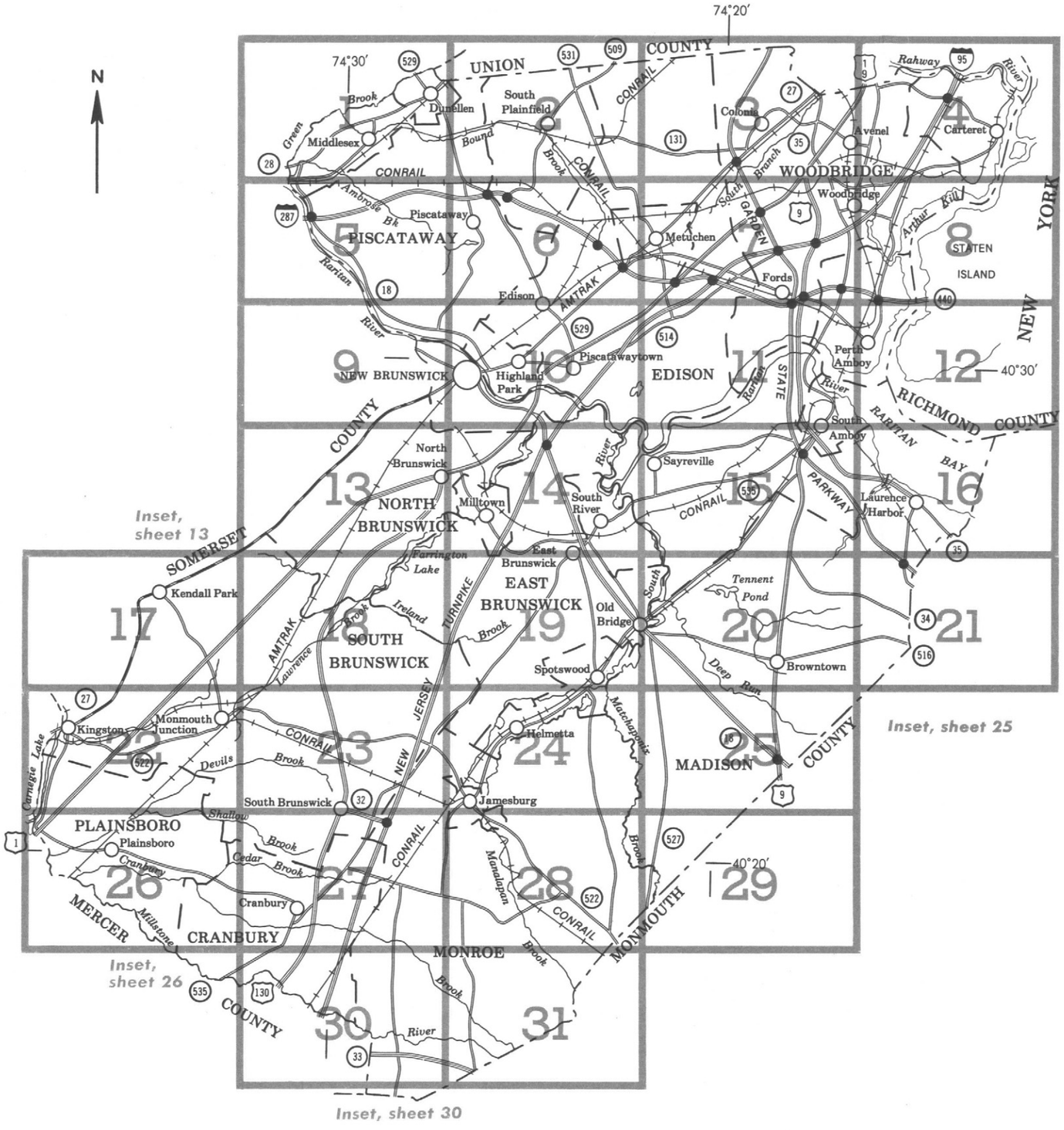
11 — Shrewsbury-Holmdel-Pemberton: Nearly level, deep, poorly drained to moderately well drained soils with a loamy subsoil and a loamy or sandy substratum; on uplands

12 — Klej-Atsion-Evesboro: Nearly level to strongly sloping, deep, excessively well drained and moderately well drained to poorly drained soils with a sandy subsoil and substratum; on terraces and uplands

13 — Humaquepts-Manahawkin-Mullica: Nearly, level, deep, somewhat poorly drained to very poorly drained soils with a loamy or mucky subsoil and a loamy or sandy substratum; on flood plains and uplands

14 — Sulfaquents-Sulfihemists-Psamments: Nearly level, deep, excessively drained to very poorly drained mineral and organic soils with a grayish or black subsoil; on tidal flats

Compiled 1981



INDEX TO MAP SHEETS

MIDDLESEX COUNTY, NEW JERSEY

Scale 1:190,080

1 0 1 2 3 Miles

1 0 3 6 Km

SOIL LEGEND

The first letter, always a capital, is the initial letter of the soil name. The second letter is a capital if the mapping unit is broadly defined; otherwise, it is a small letter. The third letter, always a capital, A, B, C, D or E, indicates the slope. Most symbols without a slope letter are those of nearly level soils; however, some are for soils that have a considerable range of slope but have similar use interpretations.

SYMBOL	NAME
At	Atsion sand
BoB	Boonton loam, 2 to 5 percent slopes
BoC	Boonton loam, 5 to 10 percent slopes
BoD	Boonton loam, 10 to 15 percent slopes
BUB	Boonton-Urban land complex, 0 to 5 percent slopes
ChA	Chalfont silt loam, 0 to 2 percent slopes
ChB	Chalfont loam, 2 to 5 percent slopes
DnA	Downer loamy sand, 0 to 5 percent slopes
DnC	Downer loamy sand, 5 to 10 percent slopes
DoB	Downer sandy loam, 2 to 5 percent slopes
DTB	Downer-Urban land complex, 0 to 10 percent slopes
DTD	Downer-Urban land complex, 10 to 15 percent slopes
DUA	Dunellen-Urban land complex, 0 to 5 percent slopes
DvA	Dunellen Variant sandy loam, 0 to 2 percent slopes
DvB	Dunellen Variant sandy loam, 2 to 5 percent slopes
DWA	Dunellen Variant-Urban land complex, 0 to 5 percent slopes
Ek	Elkton loam
EoA	Ellington Variant sandy loam, 0 to 2 percent slopes
EoB	Ellington Variant sandy loam, 2 to 5 percent slopes
ESA	Ellington Variant-Urban land complex, 0 to 5 percent slopes
EvB	Evesboro sand, 0 to 5 percent slopes
EvC	Evesboro sand, 5 to 10 percent slopes
EvD	Evesboro sand, 10 to 15 percent slopes
Fa	Fallsington sandy loam
Fb	Fallsington loam
Fd	Fallsington Variant loam
FrB	Fort Mott loamy sand, 0 to 5 percent slopes
HaA	Haledon silt loam, 0 to 2 percent slopes
HaB	Haledon silt loam, 2 to 5 percent slopes
HBB	Haledon-Urban land complex, 0 to 5 percent slopes
HcA	Haledon Variant silt loam, 0 to 2 percent slopes
HeA	Hammonton loamy sand, 0 to 3 percent slopes
HIA	Hammonton laomy sand, clayey substratum, 0 to 3 percent slopes
HmA	Hammonton sandy loam, 0 to 2 percent slopes
HoA	Holmdel fine sandy loam, 0 to 2 percent slopes
HU	Humaquepts, frequently flooded
KeA	Keyport sandy loam, 0 to 2 percent slopes
KeB	Keyport sandy loam, 2 to 5 percent slopes
KeD	Keyport sandy loam, 10 to 15 percent slopes
KfA	Keyport loam, 0 to 2 percent slopes
KfB	Keyport loam, 2 to 5 percent slopes
KfC	Keyport loam, 5 to 10 percent slopes
KfD	Keyport loam, 10 to 15 percent slopes
KGB	Keyport-Urban land complex, 0 to 10 percent slopes
KlA	Klej loamy sand, 0 to 3 percent slopes
KmA	klej loamy sand, clayey substratum, 0 to 3 percent slopes
KUA	Klej clayey substratum-Urban land complex, 0 to 5 percent slopes
KvB	Klinesville shaly loam, 0 to 5 percent slopes
KvD	Klinesville shaly loam, 5 to 15 percent slopes
KvE	Klinesville shaly loamy, 15 to 25 percent slopes
KWB	Klinesville-Urban land complex, 0 to 5 percent slopes
LaA	Lakehurst sand, 0 to 3 percent slopes
LeB	Lakewood sand, 2 to 8 percent slopes
LnA	Lansdowne silt loam, 0 to 2 percent slopes
LnB	Lansdowne silt loam, 2 to 5 percent slopes
LUA	Lansdowne-Urban land complex, 0 to 5 percent slopes
LvA	Lansdowne Variant silt loam, 0 to 2 percent slopes
Ma	Manahawkin muck
MeA	Matapeake silt loam, 0 to 2 percent slopes
MeB	Matapeake silt loam, 2 to 5 percent slopes
MgA	Mattapex silt loam, 0 to 2 percent slopes
MgB	Mattapex silt loam, 2 to 5 percent slopes
MoA	Mount Lucas silt loam, 0 to 2 percent slopes
MoB	Mount Lucas silt loam, 2 to 5 percent slopes
MsB	Mount Lucas very stony silt loam, 0 to 5 percent slopes
Mu	Mullica sandy loam
NaA	Nixon loam, 0 to 2 percent slopes
NaB	Nixon loam, 2 to 5 percent slopes
NCB	Nixon-Urban land complex, 0 to 5 percent slopes
NfA	Nixon Variant loam, 0 to 2 percent slopes
NfB	Nixon Variant loam, 2 to 5 percent slopes
NGA	Nixon Variant-Urban land complex, 0 to 5 percent slopes
Pa	Parsippany silt loam
Pb	Parsippany silt loam, frequently flooded
Pc	Parsippany Variant silt loam
PeA	Pemberton loamy sand, 0 to 3 percent slopes
PfA	Penn silt loam, 0 to 2 percent slopes
PfB	Penn silt loam, 2 to 5 percent slopes
PhD	Phalanx loamy sand, 2 to 15 percent slopes
PL	Pits, clay
PM	Pits, sand and gravel
PN	Psamments, nearly level
PO	Psamments, sulfidic substratum
PW	Psamments, waste substratum
ReA	Reaville silt loam, 0 to 2 percent slopes
ReB	Reaville silt loam, 2 to 5 percent slopes
RFA	Reaville-Urban land, complex, 0 to 5 percent slopes
Rh	Reaville Variant silt loam
Ro	Rowland silt loam
SaA	Sassafras sandy loam, 0 to 2 percent slopes
SaB	Sassafras sandy loam, 2 to 5 percent slopes
SaC	Sassafras sandy loam, 5 to 10 percent slopes
SgB	Sassafras gravelly sandy loam, 2 to 5 percent slopes
SgC	Sassafras gravelly sandy loam, 5 to 10 percent slopes
SgD	Sassafras gravelly sandy loam, 10 to 15 percent slopes
SlA	Sassafras loam, 0 to 2 percent slopes
SlB	Sassafras loam, 2 to 5 percent slopes
SMB	Sassafras-Urban land complex, 0 to 5 percent slopes
SrA	Shrewsbury sandy loam, 0 to 2 percent slopes
SU	Sulfaquents and Sulfihemists, frequently flooded
TnB	Tinton loamy sand, 0 to 5 percent slopes
UB	Udorthents, bedrock substratum
UC	Udorthents, clayey substratum
UD	Udorthents, wet substratum-urban land complex
UL	Urban land
Wa	Watchung very stony silt loam, 0 to 2 percent slopes
WdA	Woodstown sandy loam, 0 to 2 percent slopes
WdB	Woodstown sandy loam, 2 to 5 percent slopes
WkA	Woodstown sandy loam, clayey substratum, 0 to 2 percent slopes
WkB	Woodstown sandy loam, clayey substratum, 2 to 5 percent slopes
WlA	Woodstown loam, 0 to 2 percent slopes
WlB	Woodstown loam, 2 to 5 percent slopes
WU	Woodstown-Urban land complex, 0 to 5 percent slopes

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline & neatline

AD HOC BOUNDARY (label)

- Small airport, airfield, park, oilfield, cemetery, or flood pool (Hedley Airstrip; FLOOD POOL LINE)

STATE COORDINATE TICK

LAND DIVISION CORNERS (sections and land grants)

ROADS

- Divided (median shown if scale permits)
- Other roads
- Trail

ROAD EMBLEM & DESIGNATIONS

- Interstate (21)
- Federal (173)
- State (28)
- County, farm or ranch (1283)

RAILROAD

POWER TRANSMISSION LINE (normally not shown)

PIPE LINE (normally not shown)

FENCE (normally not shown)

LEVEES

- Without road
- With road
- With railroad

DAMS

- Large (to scale)
- Medium or small (water; w)

PITS

- Gravel pit
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban areas)
- Church
- School
- Indian mound (label) (Indian Mound)
- Located object (label) (Tower)
- Tank (label) (Gas)
- Wells, oil or gas
- Windmill
- Kitchen midden

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
  - Double-line (label) (CANAL)
  - Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial (water; w)
- Intermittent (int; i)

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Spring
- Well, artesian
- Well, irrigation
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

- SOIL DELINEATIONS AND SYMBOLS (CnB; WaC2)
- ESCARPMENTS
  - Bedrock (points down slope)
  - Other than bedrock (points down slope)
- SHORT STEEP SLOPE
- GULLY
- DEPRESSION OR SINK
- SOIL SAMPLE SITE (normally not shown) (S)
- MISCELLANEOUS
  - Blowout
  - Clay spot
  - Gravelly spot
  - Gumbo, slick or scabby spot (sodic)
  - Dumps and other similar non soil areas
  - Prominent hill or peak
  - Rock outcrop (includes sandstone and shale)
  - Saline spot
  - Sandy spot
  - Severely eroded spot
  - Slide or slip (tips point upslope)
  - Stony spot, very stony spot (0)

MIDDLESEX COUNTY, NEW JERSEY NO. 1

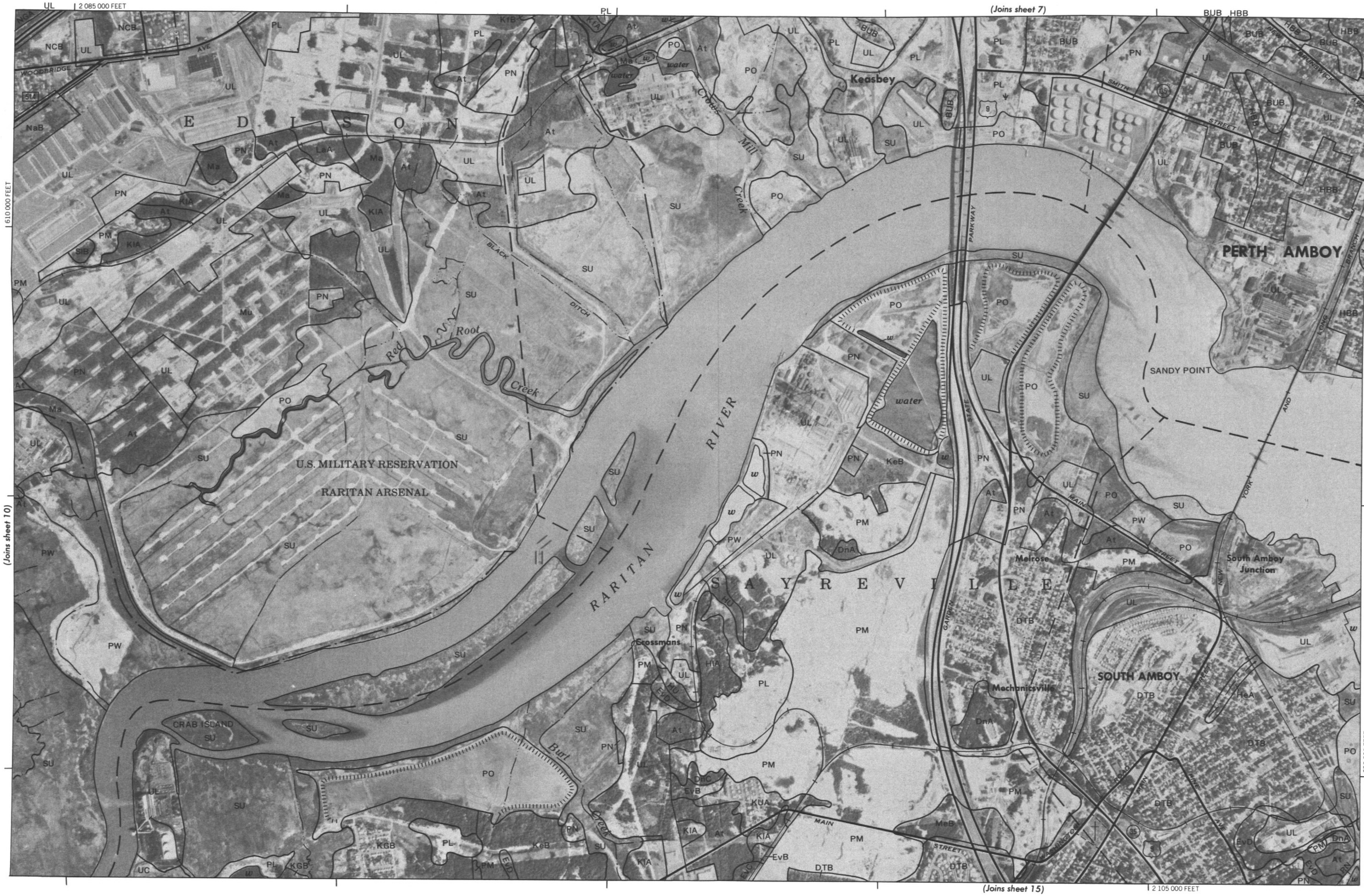
This map is compiled on 1970 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This map is compiled on 1970 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

MIDDLESEX COUNTY, NEW JERSEY NO. 10

11

N



1 Mile
5000 Feet
Scale 1:20000

MIDDLESEX COUNTY, NEW JERSEY NO. 11

This map is compiled on 1970 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

12

N

1 Mile
5000 Feet
0
0
Scale 1:20000
¼
1000
½
2000
¾
3000
1
4000
5000

(Joins sheet 8)

2 130 000 FEET

610 000 FEET

(Joins sheet 11)

PERTH AMBOY

ARTHUR KILL

MIDDLESEX COUNTY
RICHMOND COUNTY

NEW JERSEY
NEW YORK

R A R I T A N B A Y

SOUTH AMBOY

SAYREVILLE

600 000 FEET

PN

2 110 000 FEET

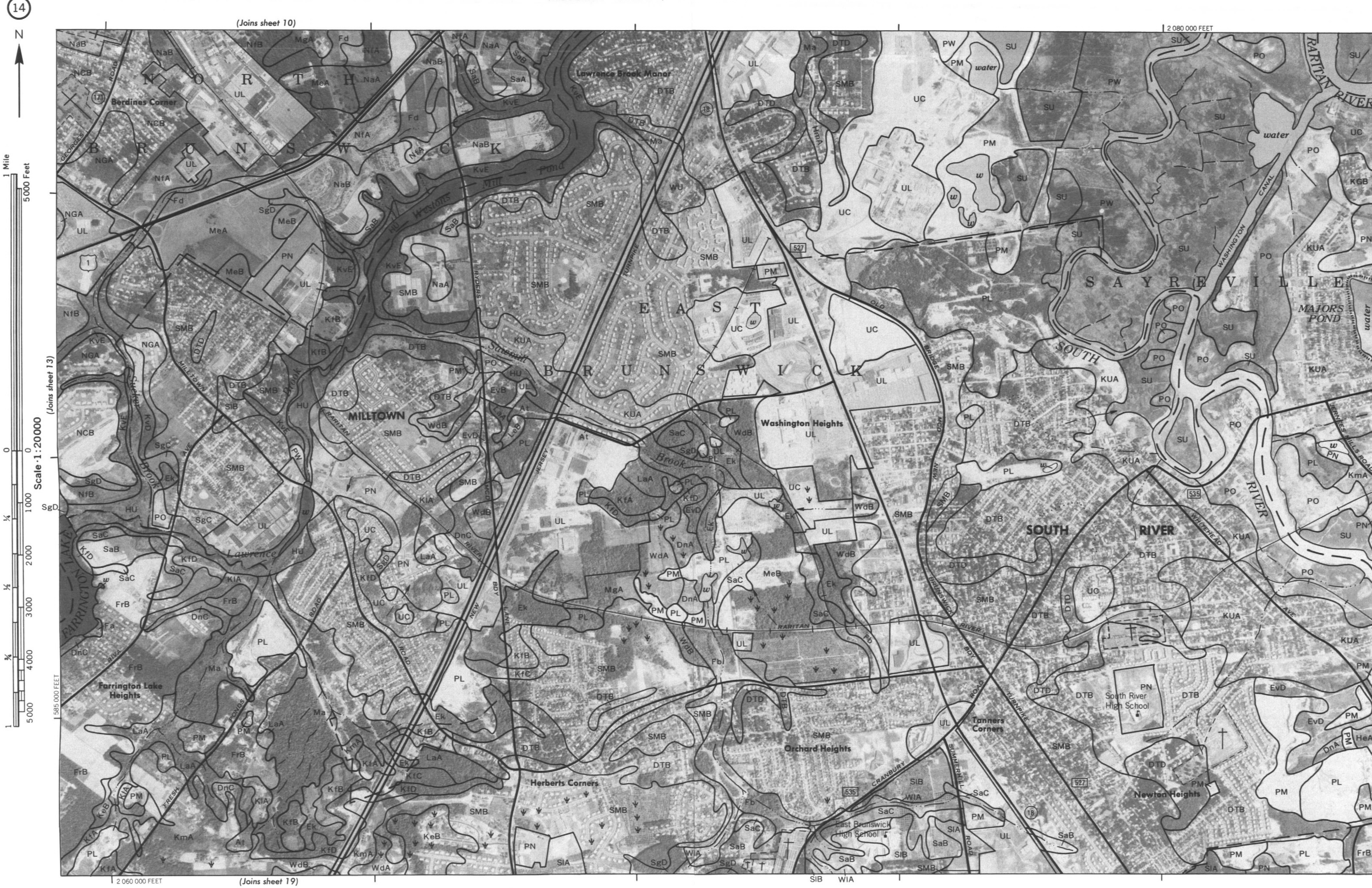
(Joins sheet 16)

This map is compiled on 1970 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating Agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

MIDDLESEX COUNTY, NEW JERSEY NO. 12

MIDDLESEX COUNTY, NEW JERSEY NO. 13

This map is compiled on 1970 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This map is compiled on 1970 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

MIDDLESEX COUNTY, NEW JERSEY NO. 14

MIDDLESEX COUNTY, NEW JERSEY NO. 15

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Coordinate grid ticks and land division corners, if shown, are approximately positioned.

15

N

Scale 1:20000

1 Mile 5000 Feet

2 085 000 FEET

595 000 FEET

(Joins sheet 11)

(Joins sheet 14)

(Joins sheet 16)

(Joins sheet 20)

2 105 000 FEET

585 000 FEET

EDISON

SOUTH AMBOY

SAYREVILLE

SOUTH RIVER

EAST BRUNSWICK

Sayreville Station

Sayreville Junction

Parlin

Ernston

Laurel Park

Madison Park

Sayre Woods

Runyon

Sayreville War Memorial High School

RARITAN RIVER

SOUTH RIVER

Tennent Br

Pond Creek

Melvins Creek

CHEESEQUAKE CREEK

MAJORS POND

CHEESEQUAKE STATE PARK

STATE PARK

MAIN STREET

WASHINGTON ROAD

RARITAN ROAD

JERNEES MILL ROAD

BORDENTOWN AVENUE

GARDEN STATE PARKWAY

CENTRAL JERSEY TURNPIKE

AMBOY ROAD

PENN LINE

535

35

34

9

MIDDLESEX COUNTY, NEW JERSEY NO. 16

This map is compiled on 1970 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

MIDDLESEX COUNTY, NEW JERSEY NO. 17

This map is compiled on 1970 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

2 010 000 FEET

580 000 FEET

(Joins inset, sheet 13)

17

N

1 Mile

5000 Feet

Scale 1:20000

SOMERSET COUNTY

SOUTH BRUNSWICK

Kendall Park

Ten Mile Run

Little Rocky Hill

Sand Hills

NEW ROAD

BEEKMAN ROAD

SAND HILLS ROAD

MAJOR ROAD

Bi Carters Brook

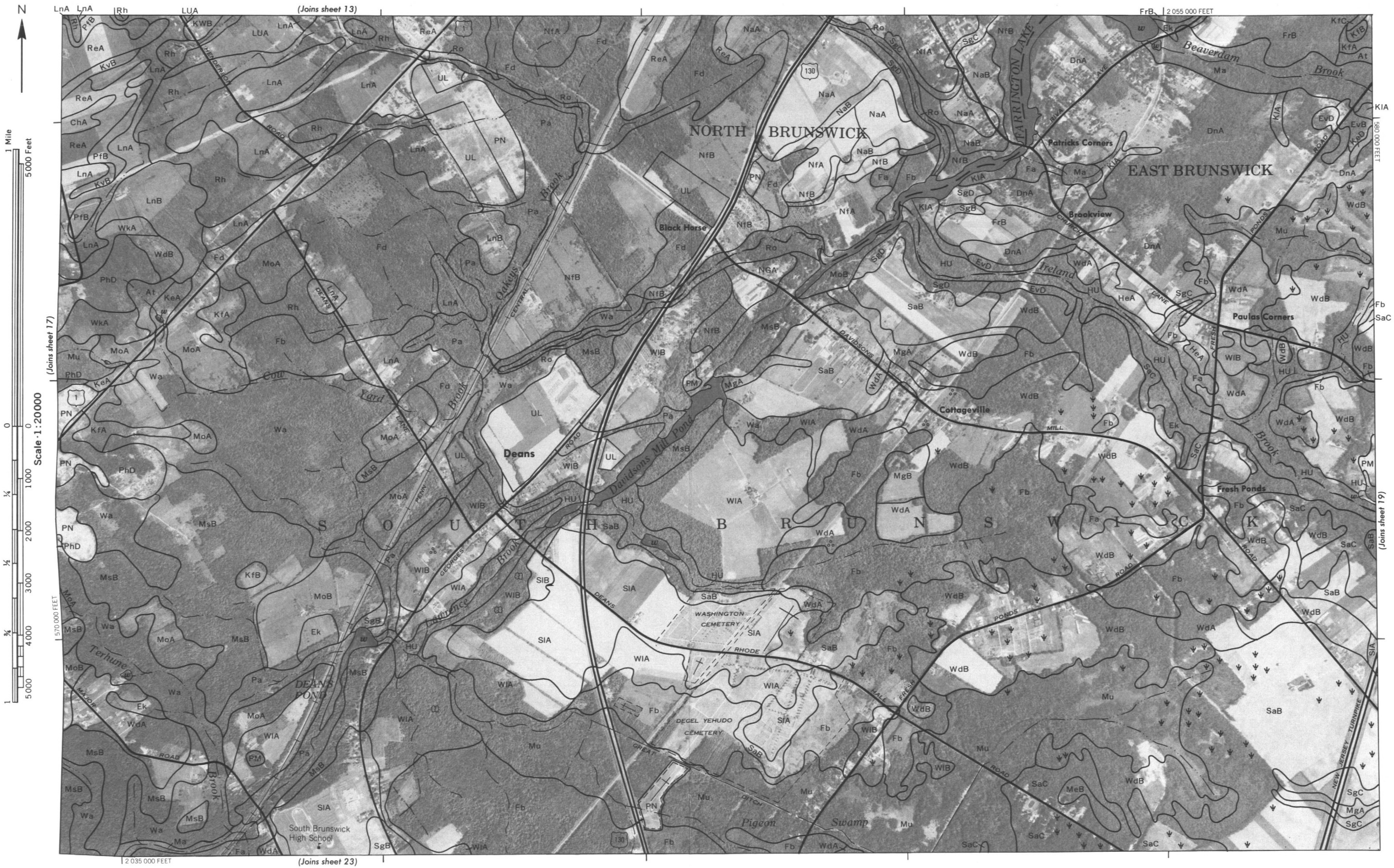
Heathcote Brook Branch

(Joins sheet 18)

(Joins sheet 22)

570 000 FEET

2 030 000 FEET



This map is compiled on 1970 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

19

MIDDLESEX COUNTY, NEW JERSEY NO. 19

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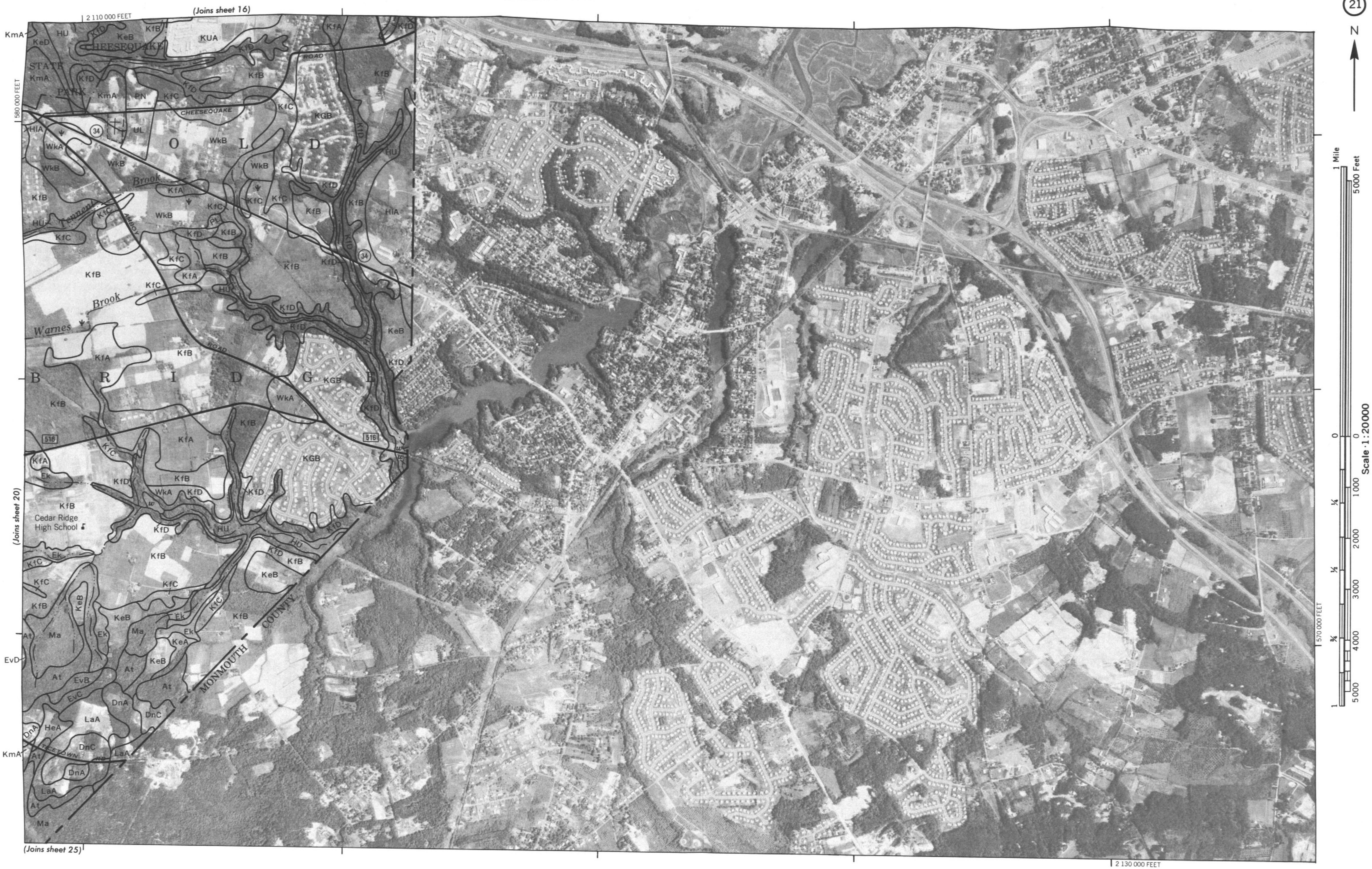
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

MIDDLESEX COUNTY, NEW JERSEY NO. 20



MIDDLESEX COUNTY, NEW JERSEY NO. 21

This map is compiled on 1970 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

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MIDDLESEX COUNTY, NEW JERSEY NO. 23

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MIDDLESEX COUNTY, NEW JERSEY NO. 25
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Coordinate grid ticks and land division corners, if shown, are approximately positioned.

25

N

2 085 000 FEET

565 000 FEET

KmA *(Joins sheet 20)*

(Joins sheet 24)

(Joins sheet 29)

555 000 FEET

2 105 000 FEET

OLD BRIDGE

Moerles Corners

Redshaw Corner

Brook

Run

Scale 1:20000

1 Mile 0 5000 Feet

1 ¼ 2000 1000

¾ 4000 3000

½ 5000

26

N

1 Mile
5000 Feet
0
0
Scale 1:20000
¼
½
¾
1
1000
2000
3000
4000
5000

(Joins sheet 22)

2 030 000 FEET

545 000 FEET

535 000 FEET

531 000 FEET

533 000 FEET

2 027 000 FEET

2 010 000 FEET

(Joins lower right)

(Joins sheet 30)

(Joins sheet 27)

(Joins inset)

P L A I N S B O R O

C R A N B U R Y

MERCER COUNTY

MIDDLESEX COUNTY, NEW JERSEY NO. 26

This map is compiled on 1970 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

MIDDLESEX COUNTY, NEW JERSEY NO. 27

This map is compiled on 1970 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

(28)

N

(Joins sheet 24)

(Joins sheet 27)

(Joins sheet 29)

(Joins sheet 31)

1 Mile

5000 Feet

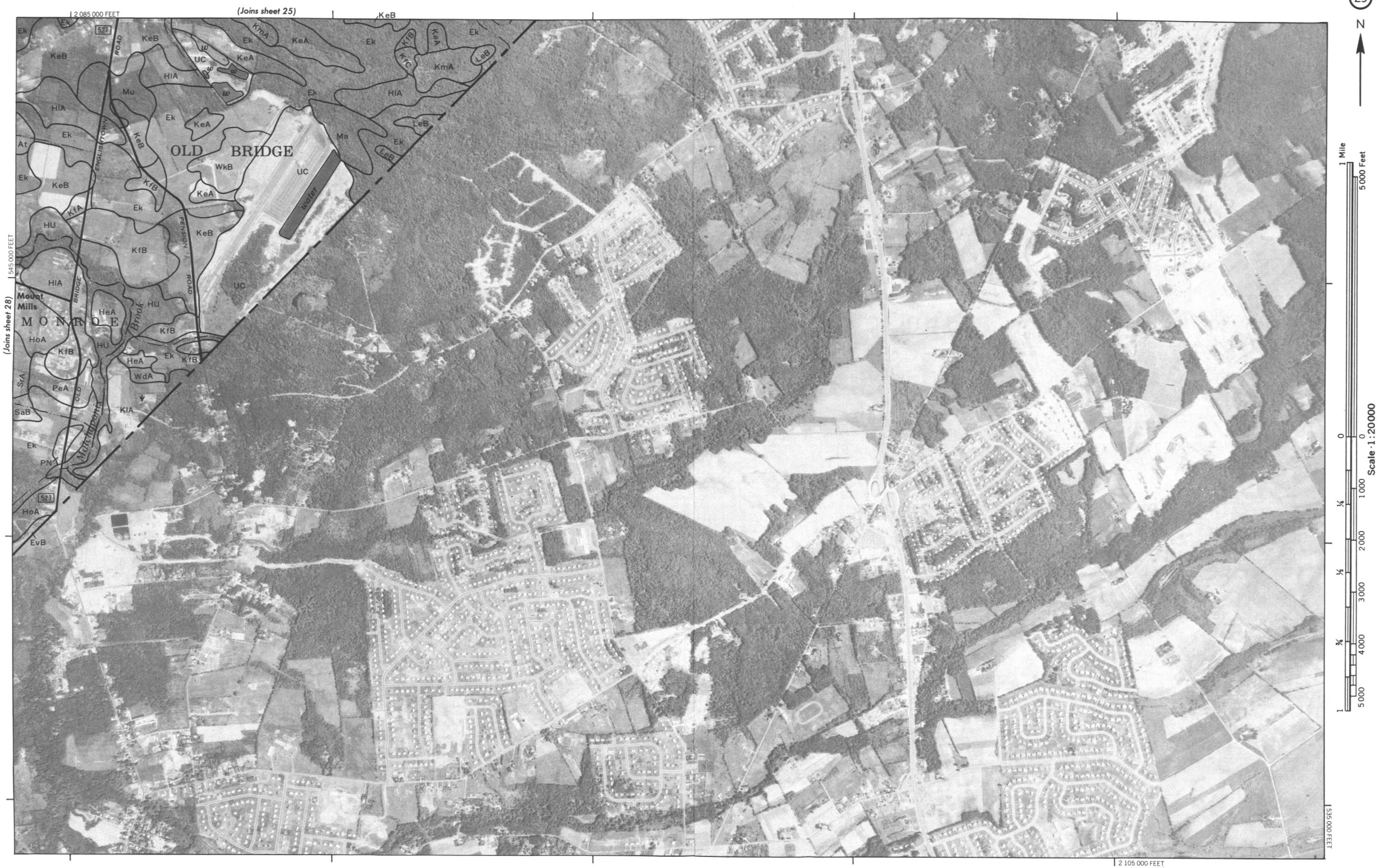
Scale 1:20000

0 — 1/4 — 1/2 — 3/4 — 1

0 — 1000 — 2000 — 3000 — 4000 — 5000

This map is compiled on 1970 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

MIDDLESEX COUNTY, NEW JERSEY NO. 28



MIDDLESEX COUNTY, NEW JERSEY NO. 29

This map is compiled on 1970 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

MIDDLESEX COUNTY, NEW JERSEY - SHEET NUMBER 3

3

N

2 085 000 FEET

645 000 FEET

635 000 FEET

2 105 000 FEET

UNION COUNTY

COLONIA

Colonia Senior High School

Potters

Lynn Woodoaks

Shore View

New Dover

Woodbridge Oaks

EDISON

John P. Stevens High School

ISELIN

Colonia Senior High School

AVENEL

STATE PRISON

Woodbridge Senior High School

Edgar

EDISON STATE PARK

Edison Memorial Tower

Menlo Park

MT LEBANON CEMETERY

CLOVERLEAF CEMETERY

ST. GERTRUDES CEMETERY

(Joins sheet 2)

(Joins sheet 4)

1 Mile 5000 Feet

Scale 1:20000

MIDDLESEX COUNTY, NEW JERSEY NO. 3

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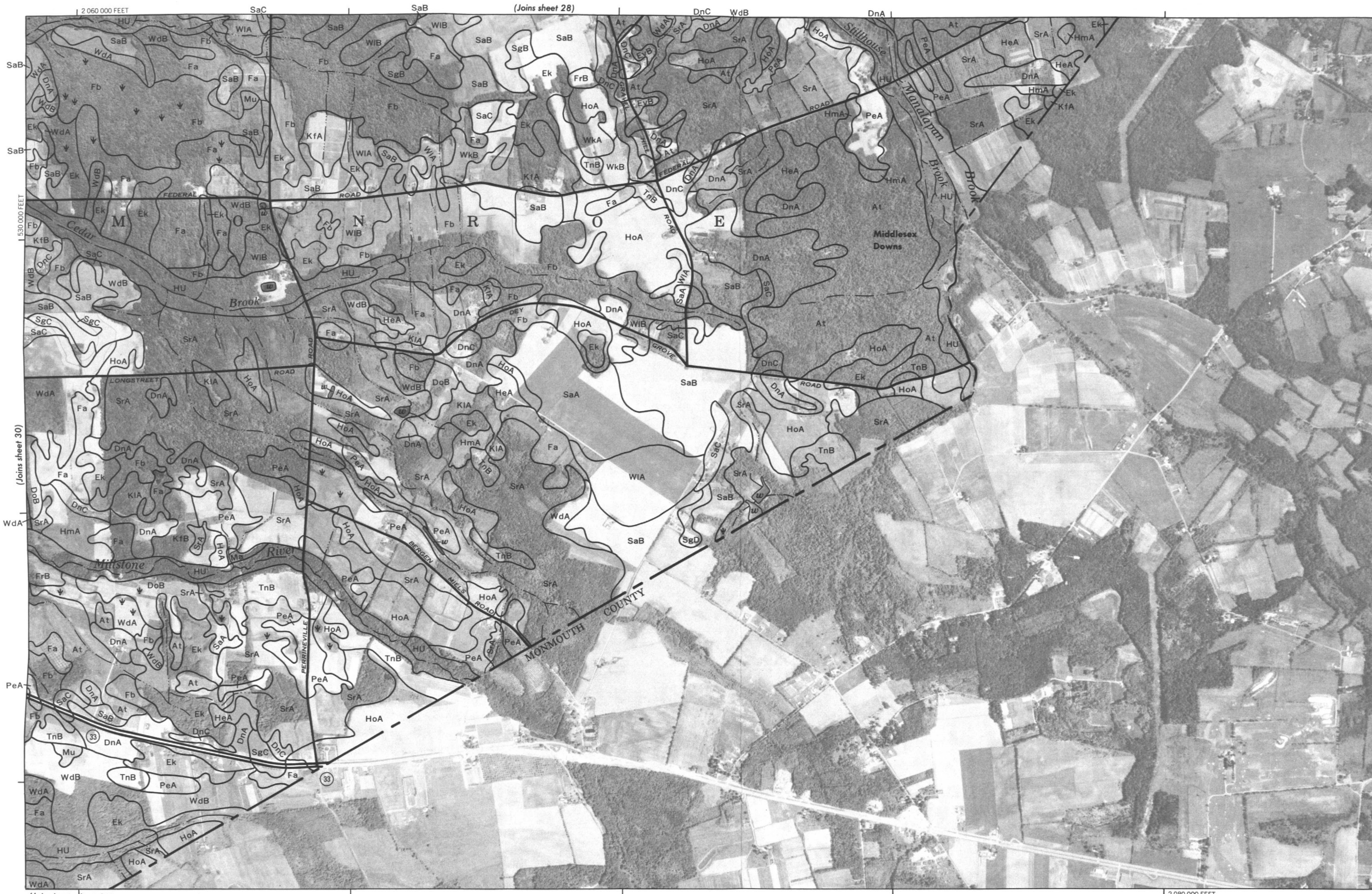

N

Scale 1:20000

1 Mile

5000 Feet

MIDDLESEX COUNTY, NEW JERSEY NO. 31

This map is compiled on 1970 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

4

N

1 Mile
5 000 Feet
Scale 1:20000
0 ¼ ½ ¾ 1
0 1000 2000 3000 4000 5000

This map is compiled on 1970 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

MIDDLESEX COUNTY, NEW JERSEY NO. 4

5

MIDDLESEX COUNTY, NEW JERSEY NO. 5

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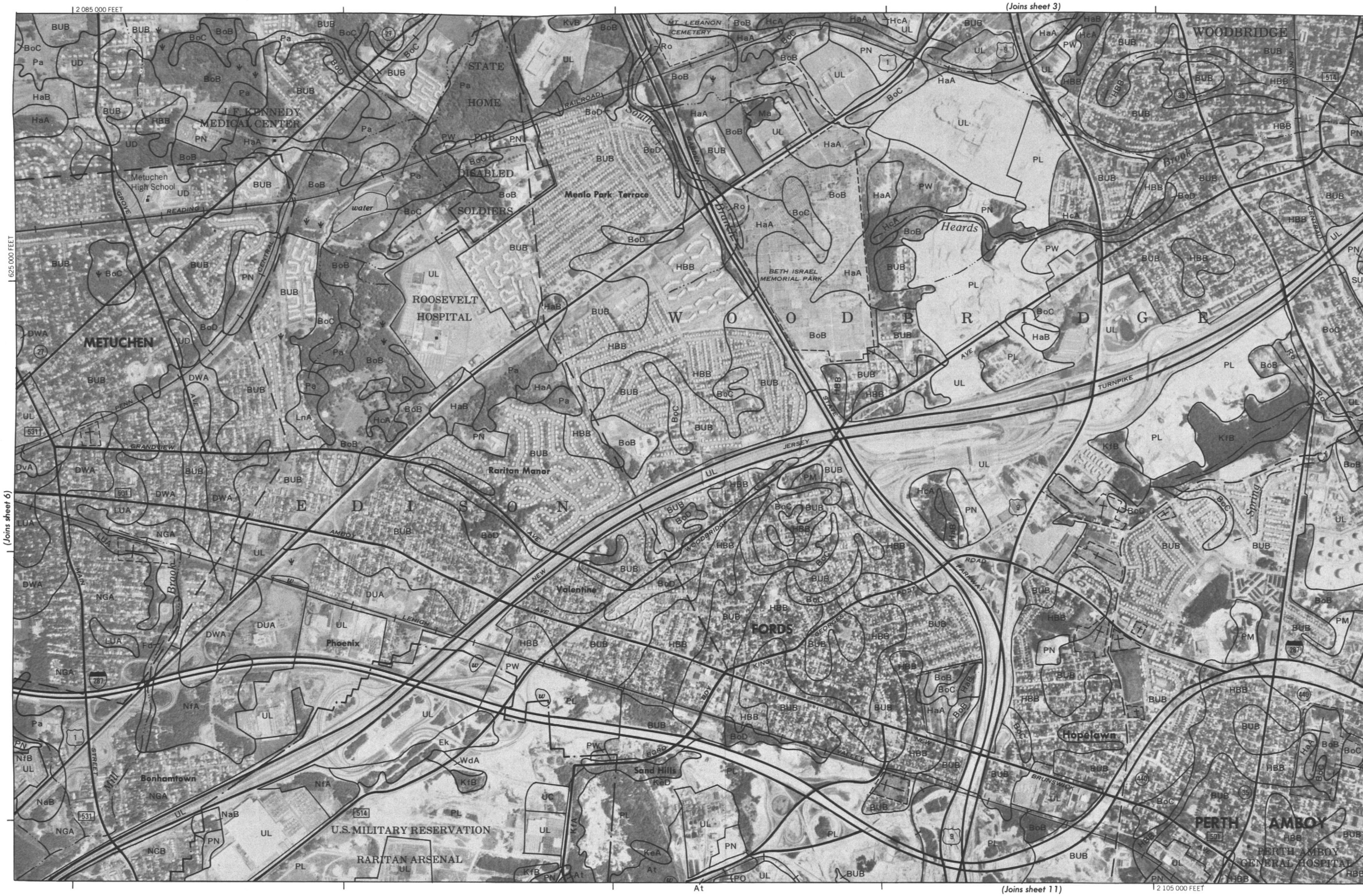
MIDDLESEX COUNTY, NEW JERSEY NO. 6

7



N

Scale 1:20000

1 Mile

5000 Feet

MIDDLESEX COUNTY, NEW JERSEY NO. 7

This map is compiled on 1970 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

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Coordinate grid ticks and land division corners, if shown, are approximately positioned.

MIDDLESEX COUNTY, NEW JERSEY NO. 8

N

1 Mile

5000 Feet

Scale 1:20000

MIDDLESEX COUNTY, NEW JERSEY NO. 9

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